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Review

Investigating rice value chain research: a science mapping

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Abstract: As a principal food crop globally, particularly for Asians, rice remains an interesting and growing topic for interdisciplinary, policy-relevant, and impactful research. This study aimed to identify literature development and scientific mapping in rice value chain studies. This study used secondary data in the form of peer-reviewed journal articles related to the rice value chain, with a total of 126 documents obtained from the Scopus database as of April 2, 2025. Data were analyzed using bibliometric analysis incorporating an enhanced strategic diagram and thematic evolution mapping. Results showed that rice value chain research topics are divided into five clusters: (1) farmers' adaptation and market dynamics, (2) technological innovation and value chain efficiency, (3) value chain governance, (4) food security and policy, and (5) consumer behavior and sustainability. The results also showed that the emerging topics of rice value chain research are developing toward a more multidimensional and integrated approach focused on technology integration, sustainable practices, climate change response, digital transformation, gender inclusivity, multi-stakeholder partnerships, nutrition impact, environmental resilience, and a deeper understanding of consumer preferences. The results provide insights into research gaps and offer new research opportunities for the future sustainable, resilient, equitable, and inclusive rice value chain.

Keywords: bibliometric analysis; enhanced strategic diagram; governance; rice; upgrading

1. Introduction

In recent decades, rice has maintained its centrality in global agricultural and development discourse [1]. As a staple food for more than half of the world's population, rice is critical not only to food security but also to socio-economic stability and environmental sustainability, particularly in rice-dependent countries such as Indonesia, Vietnam, Bangladesh, and India [1–3]. As a result, its role in supporting rural livelihoods, influencing national food policies, and shaping supply chain governance has attracted significant scholarly attention from various academic disciplines.

Research on the rice value chain, encompassing activities from input supply and production to processing, distribution, and consumption, has evolved in response to changing global demands, technological advancements, environmental concerns, and institutional reforms. Numerous research related to rice value chains has been conducted in different contexts and issues, such as rice production efficiency [4], price transmission [5], contract farming [6–8], traceability [9,10], climate resilience [11], supply chain coordination [12], smart supply chain [13], and consumer preference [14,15]. However, while the volume of publications continues to grow, there remains a lack of holistic analysis that maps the intellectual structure, trends, and thematic evolution of rice value chain studies over time.

Bibliometric analysis, defined as the quantitative assessment of scholarly publications based on citation dynamics, co-authorship relationships, keyword co-occurrences, and other bibliographic metadata, has gained extensive application in the domain of science mapping to elucidate the cognitive architecture, research trajectories, and thematic evolution within a designated academic discipline [16,17]. Bibliometric analysis is not only evaluative but also strategic as it allows researchers to identify dominant themes, influential authors or institutions, emerging or declining topics, and interdisciplinary relationships [18,19]. In the context of rice, bibliometric analysis has been widely used for science mapping, although most studies have focused on specific topics such as rice intercropping [20], greenhouse technologies in rice production [21], greenhouse gas emissions from rice cultivation [22], rice husk gasification [23], and salt stress in rice [24]. Applying such an approach to the entire rice value chain can significantly enrich our understanding of the research landscape and guide scholars, practitioners, and policymakers in prioritizing future research directions.

Despite the increasing number of publications related to rice value chain management, no previous study has comprehensively visualized its knowledge structure using science mapping tools such as co-occurrence analysis and cluster visualization. This gap signifies a critical need for a comprehensive bibliometric analysis to map the intellectual structure, evolutionary trends, and thematic landscapes of rice value chain research using large-scale metadata, similar to efforts in rural tourism and coffee value chain [25,26]. Unlike previous studies, this research focuses on the context of the rice value chain, which, according to Gomez [27] and Barrett [28], refers to the series of all activities required to bring rice products to consumers, including agricultural input, production, storage, processing, marketing, distribution, and consumption. This study aims to identify the development of literature and scientific mapping in rice value chain studies. The findings of this research are useful for exploring research gaps and directing future studies toward the development of a sustainable rice value chain. Specifically, the study seeks to answer the following questions: 1) What are the current intellectual structures and main themes in rice value chain research? 2) Which topics are emerging themes, and how are they interlinked across disciplines? 3) What are the underexplored areas that offer potential for future research?

2. Materials and methods

2.1. Data collection

This study used secondary data in the form of scientific articles related to the rice value chain. Data were collected from the Scopus database, which is the largest multidisciplinary database, covering more than 22,000 peer-reviewed journals in various fields, including science, social sciences, and humanities [29,30]. In this data collection, three steps were used: formulation of research questions, literature search, and evaluation of search results [31,32]. To answer research questions (RQs), this research used the Scopus database with a search strategy focused on the phrase "rice value chain*" in the search domain, namely article title, abstract, and keywords. We specifically used this exact phrase to prioritize search precision over recall, ensuring the dataset focuses strictly on the "rice value chain" as a specific unit analysis. This approach is essential in bibliometrics to maintain the coherence of the generated thematic cluster [16].

Following a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)-style flow diagram (Figure 1), the initial literature search was conducted on April 2, 2025, with 128 documents obtained from Scopus. The second literature search was conducted by applying the inclusion criteria of only articles in English and at the final publication stage. This study included all document types (article, book chapter, review, conference paper, and book) and source types (journal, book, book series, and conference proceedings). This second literature search obtained 126 documents. Data were then processed and analyzed to answer the research questions.

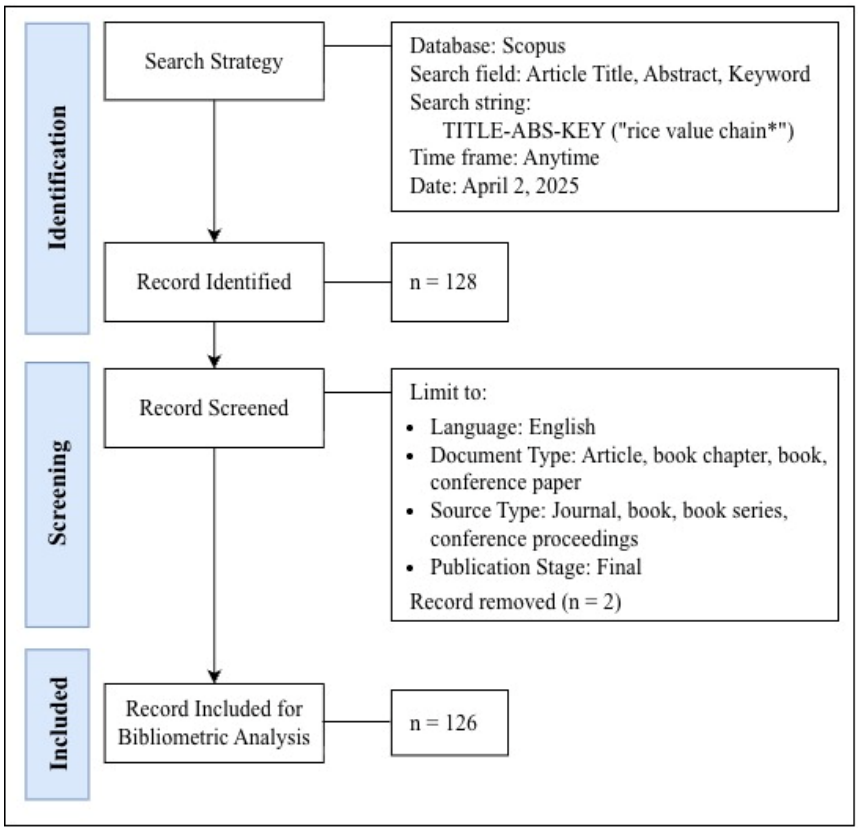

Figure 1. PRISMA flow diagram of the study selection process for rice value chain literature.

2.2. Analysis

To answer the three research questions, this study conducted bibliometric analysis using VOSviewer, enhanced strategic diagram (ESD) analysis using Biblioplot [33], and content analysis. Initially, co-occurrence analysis, a bibliometric methodology, was employed to reveal the core themes associated with studies focused on the rice value chain. This approach allows visualization of the distribution and network relationships between author-defined keywords, called network visualization, which are then grouped into identified thematic clusters. We used a full counting approach and a VOSviewer Thesaurus File to standardize terminology that varied among scholars (e.g., singular vs. plural forms like *farmer* vs. *farmers*) during processing. Next, this study explored emerging research themes in the rice value chain domain using another result of co-occurrence analysis, namely overlay visualization, incorporating ESD. The overlay visualization illustrates the temporal distribution of keyword nodes based on the average publication year of the articles. According to Wahyoedi et al. [34], nodes with darker hues (dark blue) indicate keywords associated with older publications, while nodes with brighter hues (yellow) indicate keyword usage in current publications. Furthermore, this study also used ESD to categorize the detected keywords into eight distinct quadrants according to keyword density, centrality, and publication year in order to validate and complement this analysis [34,35]. Specifically, for recent publications, the quadrants represent core, interdisciplinary, emerging with low density, and emerging with high-density themes, whereas older publications are classified as mature, declining, isolated, and obsolete [34,35]. Thus, this study used two sets of keywords from (1) the overlay visualization (bright yellow) and (2) ESD quadrants 2 (emerging with low density) and 3 (emerging with high density) in recent publications to identify emerging themes in rice value chain studies. This approach highlights the current research trends and eventually answers the third RQ developmental direction of rice value chain studies. Third, content analysis is used to explore areas that offer potential for future research on the rice value chain.

3. Results and discussion

3.1. Current intellectual structures and main themes in rice value chain research

Co-occurrence analysis illustrates how often keywords appear in documents, allowing for the examination of their associated concepts [29]. Figure 2 shows the salient scientific map structure of the results of the co-occurrence analysis. It illustrates the network visualization of author keywords in the themes of rice value chain research until March 2025. The map represents five clusters comprising 67 author keywords, connected by 229 links with a total link strength of 279, representing the interconnectedness of keywords across the articles. To associate the five clusters with appropriate subject areas, we considered the extracted keywords and labeled each subtheme in each cluster (Figure 2, Table S1).

The first cluster (red), “farmers’ adaptation and market dynamics”, emphasizes the central role of farmers in the rice value chain, focusing on their adaptive strategies and interactions with market dynamics. Research within this cluster investigates how farmers adopt new technologies and practices ("adoption", "climate-smart agriculture") to enhance their resilience in the face of challenges like climate change and other risks. This research cluster also emphasizes geographical contexts, specifically “Ghana”, “Vietnam”, and “Uganda”, underscoring the unique challenges encountered by smallholder farmers in these regions. In addition, the cluster emphasizes the importance of "market

access" and "multi-stakeholder partnerships" in influencing smallholder farmer livelihoods and the overall effectiveness of the rice value chain. Moreover, the research cluster incorporates considerations of gender and the cross-border context into its analysis of rice value chain studies.

The second cluster, labeled “technological innovation and value chain efficiency” (green), centered on the technological advancements and innovations that enhance efficiency in the rice value chain. This research cluster examines the role of “digital technology”, “milling techniques”, and “post-harvest” technologies in optimizing processes and enhancing value. Research in this cluster also highlights the "circular economy" concept, underscoring a focus on sustainable resource utilization and waste minimization. The terms "Sub-Saharan Africa" and "Kenya" indicate an emphasis on the adoption and effects of technology within particular African settings.

The third cluster (blue), “value chain governance”, focuses on the governance structures and institutional arrangements that shape the rice value chain. This research investigates the role of contract farming and vertical coordination to analyze the impact of various institutional arrangements or governance mechanisms [36] on the efficiency, equity, and sustainability of the rice value chain. Geographic keywords such as "Africa" and "Senegal" indicate a focus on governance challenges and coordination mechanisms in the African context. In addition, the cluster examined the relationship between rice value chain and nutrition outcomes.

The fourth cluster (yellow), “food security and policy”, investigates the critical nexus of food security, policy interventions, and regional dynamics, particularly in "West Africa". Research in this cluster employs "value chain analysis" and innovative methods such as "system dynamics" [31] to address the complex interactions linking "food policy", "price transmission", and "self-sufficiency" targets. This research cluster aims to contribute to the development of effective policy frameworks that enhance regional food security outcomes.

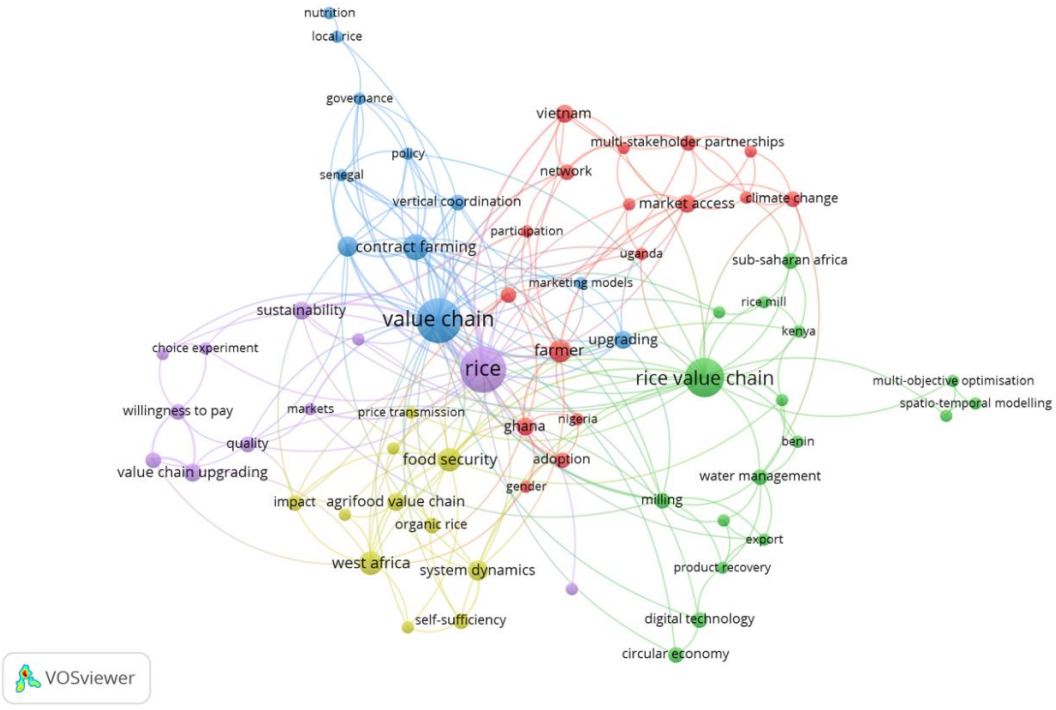

Figure 2. Network visualization of rice value chain research as of April 2, 2025 (source: Authors’ elaboration using VOSviewer).

The final cluster (purple), “consumer behavior and sustainability”, focuses on consumer behavior, preferences, and the growing emphasis on sustainable quality in the rice market. This research cluster utilizes methods such as “experimental auctions” and “choice experiments” and assesses “willingness to pay” and specific attributes of rice, including “quality”, “nutrition”, and “sustainability”. This cluster further emphasizes upgrading strategies as one of the main dimensions for rice value chain development [37,38], as indicated by keywords such as "value chain upgrading" and "traceability”.

The five clusters derived from the co-occurrence analysis collectively represent a complex landscape of rice value chain research. The findings reveal that rice value chain studies encompass a range of perspectives, from micro-level analyses of farmer decision-making and macro-level examinations of policy and market dynamics. The findings emphasize the interrelation of factors influencing the rice value chain, encompassing production practices and consumer choices, while also underscoring the significance of technological advancements and sustainability considerations. In addition, the five clusters obtained from the co-occurrence analysis indicate prevailing themes and directions for future research on the rice value chain.

3.2. Emergent themes in rice value chain research

Emerging themes in rice value chain studies were observed using the overlay visualization of co-occurrence analysis (Figure 3) and ESD (Figure 4). Figure 3 shows the temporal distribution of keyword nodes, with brighter yellow indicating keywords prevalent in recent publications. For the 67 keywords analyzed, the average publication year of the associated literature ranges from 2013.5 to 2024.5. Keywords included in the most recent publications were as follows: “Uganda” (average year 2024.5), “digital technology” (2023.7), “multi-criteria decision analysis” (2023.5), “nutrition” (2023.0), “product recovery” (2023.0), “sustainable rice production” (2023.0), “upgrading” (2023.0), “artificial neural network” (2022.5), “choice experiment” (2022.5), “climate-smart agriculture” (2022.5), “Kenya” (2022.5), “marketing models” (2022.5), “technological change” (2022.5), “multi-stakeholder partnerships” (2022.3), and “cross-border” (2022.0).

In Figure 4, showing the novel publication year section, the top-left "Emerging" quadrant (Q2) highlights high-density research areas not yet fully central to rice value chain studies. “Digital technology" and "circular economy" are two keywords identified in this quadrant. On the other hand, the bottom-left "Emerging" quadrant (Q3) displays concepts with significant potential for growth in the rice value chain domain. Eight keywords, including “participation”, “climate-smart agriculture”, “cross-border”, “marketing models”, “local rice”, “nutrition”, “choice experiment”, and “multi-criteria decision analysis” were found in this quadrant.

Overall, emerging topics in rice value chain highlight an increasingly multidimensional research direction. Rice value chain research is evolving toward technology integration, sustainable practices, climate change response, farmer participation, multi-stakeholder partnerships, nutrition impact, and a deeper understanding of consumer preferences, aiming for a more sustainable, resilient, and inclusive rice value chain.

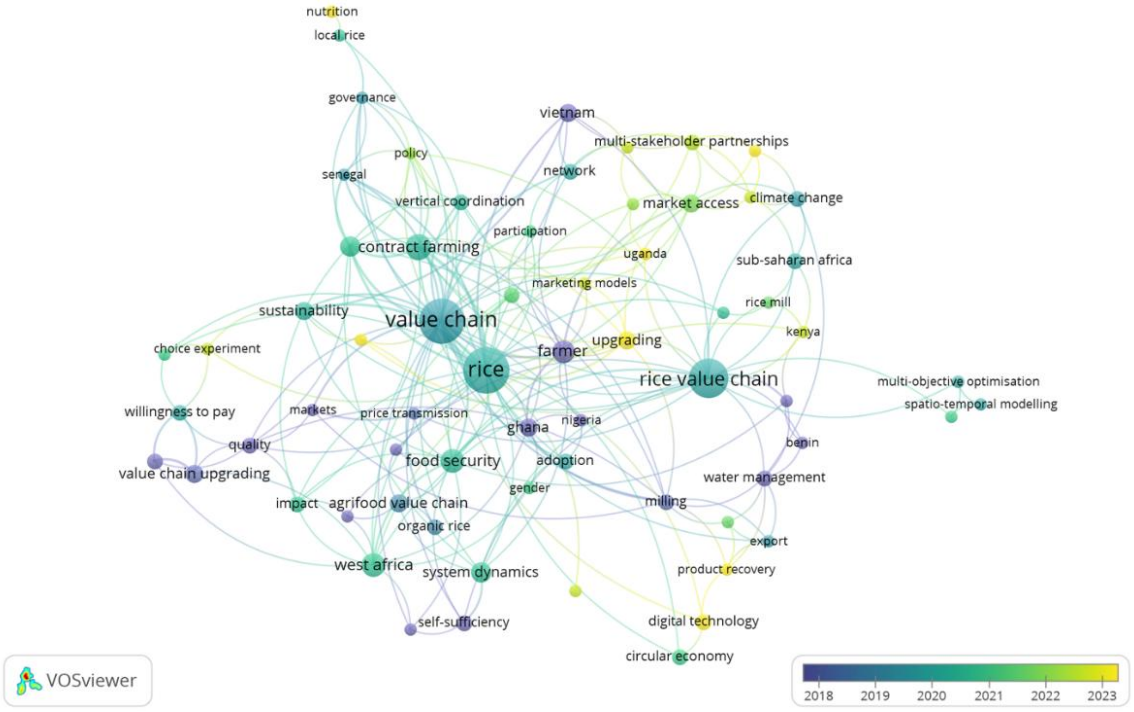

Figure 3. Overlay visualization of average publication year of rice value chain research as of April 2, 2025 (source: authors' elaboration using VOSviewer).

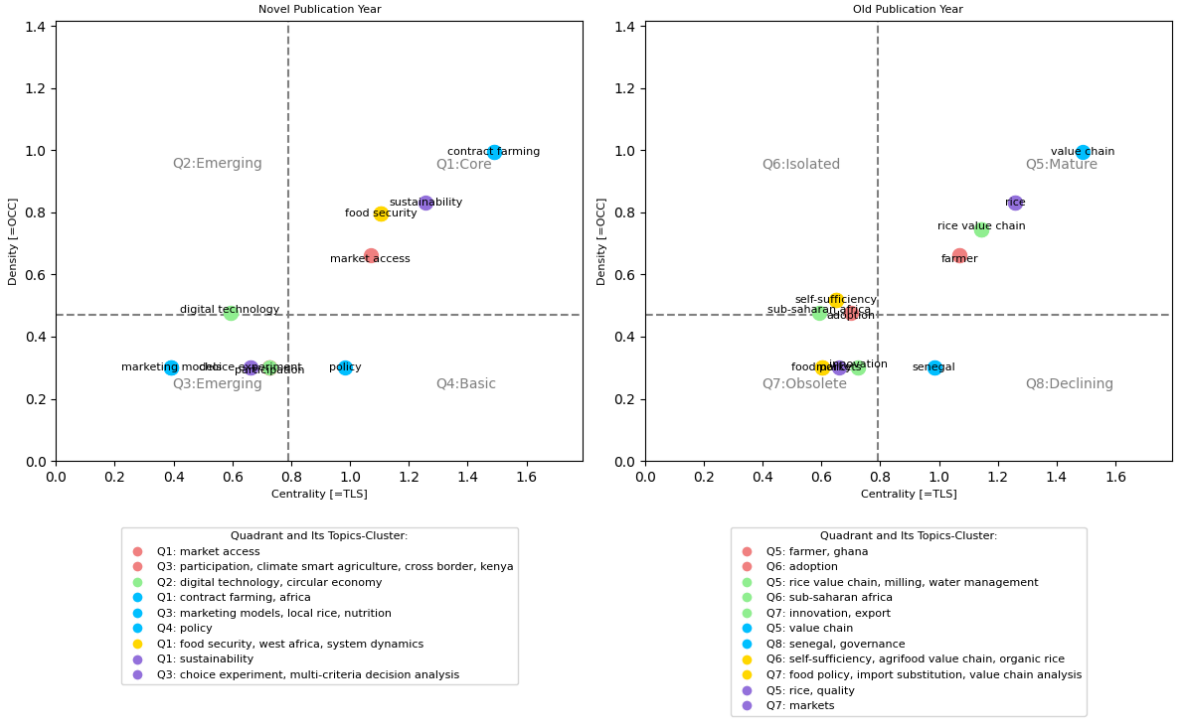

Figure 4. Enhanced strategic diagram (ESD) of rice value chain research (source: authors' elaboration using Biblioplot [33]).

3.3. Underexplored areas in rice value chain research

Based on the bibliometric analysis and ESD of rice value chain research, seven underexplored areas have emerged that present promising avenues for future investigation. These themes are either positioned in the "emerging with low density" quadrant of the novel publication year diagram or are topics that, despite their relevance, remain weakly integrated within the broader scholarly discourse.

3.3.1. Digital technology and data-driven innovation

Digital technology appears as an emerging but low-density topic, indicating growing academic interest but still limited integration in rice value chain research. As agriculture moves toward digital transformation, incorporating remote sensing, the Internet of Things, blockchain, and artificial intelligence into rice value chains, it offers a substantial opportunity to enhance traceability, transparency, and efficiency [33,39,40]. Recent studies showed that the integration of digital technologies, particularly blockchain, ensures transparency and consumer trust through verifiable production records [41,42]. Furthermore, the adoption of data-driven commercial platforms acts as a transformative catalyst, enabling rice value chains to overcome traditional barriers and compete more effectively in the global market [42]. Therefore, future studies should explore how digital platforms can optimize coordination among farmers, traders, and processors, particularly in settings with smallholder dominance.

3.3.2. Circular economy and resource recovery

Similar to digital technology, the circular economy is attracting interest among scholars, but there are still few studies in the context of rice value chains. Conversely, circular economy practices, including rice-husk bioenergy, waste reuse, and nutrient recycling, are not yet well-integrated into mainstream value chain literature. Their inclusion could address sustainability concerns, especially environmental impacts and waste reduction [43,44]. Recent review studies emphasize that a circular economy approach is vital for transforming rice by-products (straw, husk, and bran) into value-added products, thereby enhancing both environmental sustainability and value chain productivity [45]. Future research may investigate the feasibility of implementing a circular economy model throughout the rice value chain [43,46]. Further research should determine scalable business models and policies that facilitate a comprehensive transition to circularity within the rice value chain, including innovations in business models and the redesign of products and services [46–48].

3.3.3. Business models and value addition

Although "business models" have appeared in the network visualization (Figure 2) and ESD (Figure 4), the topic remains underdeveloped in density. Further studies should investigate inclusive and sustainable business models that equitably distribute value across actors, especially for smallholder farmers [49–51]. Themes like shared value creation, equity, cooperative models, or multi-stakeholder partnerships deserve more exploration in rice value chain studies [52,53]. Moreover, integrating circular business models can convert production waste into new revenue streams, enhancing both income and sustainability [45]. Consequently, future research should develop holistic and innovative business

model frameworks to capture greater economic and environmental value in the rice value chain.

3.3.4. Policy and institutional dynamics

As demonstrated by the ESD (Figure 4), notwithstanding the sustained relevance of governance and vertical coordination, “policy” is identified as an emerging node with limited interconnections in the rice value chain studies. Future research could examine how policy environments shape incentives and outcomes across the rice value chain, particularly in terms of rice price stabilization, agricultural input subsidies, and contract farming [54–58]. Recent studies emphasize that contract farming in rice value chains, as a governance mechanism, is increasingly shaped by institutional arrangements that facilitate technology transfer [59,60]. Additionally, research that investigates nutrition-sensitive interventions across the whole rice value chain may provide a powerful approach to addressing the triple burden of malnutrition, which includes micronutrient deficiencies, undernutrition, and overweight/obesity [61–63].

3.3.5. Climate-responsive strategies

The centrality and density of the "climate change" issue, as depicted in the first cluster (red) (Figure 2), are comparatively weak. This means that there is potential for further exploration of how rice value chains can adapt to or mitigate climate risks. As a prime example, the system of rice intensification (SRI) embodies climate-smart agriculture by boosting yields and climate resilience while mitigating environmental impact [64]. Building on these field-level benefits, future research could associate climate-smart agriculture with supply chain resilience [65,66], which may include the role of infrastructure, insurance mechanisms, and early-warning systems.

3.3.6. Recontextualizing declining themes

Important topics in the rice policy context, particularly in major rice-producing and trading countries, such as “self-sufficiency”, “import substitution”, and “local rice”, are now categorized as obsolete or declining (Figure 4). Nonetheless, possible emerging global food crises highlight the necessity to reevaluate these notions within modern contexts, including food sovereignty, strategic rice reserves, global value chains, and geopolitical disruptions in food supply [67,68]. Their theoretical recontextualization could revitalize their relevance in sustainable rice value chain development and improve smallholder farmer livelihood.

3.3.7. Integration of socio-environmental metrics

Sustainability is a fundamental theme as demonstrated in the ESD (Figure 4). Nonetheless, indicators for environmental performance and social inclusion have not yet been fully included in rice value chain research. Future research should integrate holistic indicators, such as carbon footprint per kilogram of rice, labor fairness, or water productivity, into value chain assessments to support informed decision-making to develop a sustainable rice value chain. For instance, future research could employ life cycle assessment methodologies, encompassing both environmental and social life cycle assessments, to evaluate environmental and social impacts in the rice value chain [68,69].

In sum, although fundamental subjects like contract farming and food security remain central to the field, the future of rice value chain research depends on enhancing and broadening its analytical frameworks. Academics may tackle current difficulties and emerging opportunities in developing more resilient and equitable value chains by emphasizing digitization, sustainability, circular economy, and inclusive policies.

4. Conclusions

The research landscape of rice value chain studies is identified around five core themes. The first research cluster focuses on the farmers' role, examining their adaptation to change and their interaction with markets, highlighting the importance of resilience and support systems. The second cluster investigates technological innovation, emphasizing advancements that drive efficiency and add value within the chain, including digital tools and circular economy principles. The third research cluster focuses on governance and coordination, examining the frameworks and regulations that influence the operations and results of the value chain. The fourth cluster examines food security in the rice sector, frequently with a regional emphasis, assessing policy effects and system dynamics. The fifth cluster focuses on consumer behavior, exploring preferences for quality and sustainable attributes, and employing economic tools to understand market demand.

The results also indicate that the emerging topics of rice value chain research are progressing toward a more multidimensional and integrated approach focused on technology integration, sustainable practices, climate change response, multi-stakeholder partnerships, farmer participation, and nutrition impact, as well as a deeper understanding of dynamic consumer behavior. This shift represents a broader recognition of the need for more holistic and integrated solutions that, for example, address not only value chain productivity and efficiency but also inclusivity, resilience, and sustainability. To provide integrated insights that foster local innovation and global learning, future research should strive to bridge multiple disciplines and contexts. Thus, further scholarly inquiry into rice value chain research, especially concerning emerging topics, is warranted.

This study is subject to certain limitations: (1) the analysis is constrained by its exclusive reliance on Scopus data and English-language publications, which may overlook relevant studies in other databases (e.g. Web of Science or Google Scholar) or regional languages from major rice-producing countries; (2) bibliometric methodologies, while efficacious, may not fully elucidate the intricacies of specific issues. Future research endeavors could benefit from the inclusion of multiple databases, non-English literature, and project reports, acknowledging the increasing salience of value chain development as a development approach for academics, practitioners, and policymakers.

Use of AI tools declaration

Authors declare that the use of AI was solely employed to enhance grammatical accuracy and language clarity.

Supplementary

Table S1. Identified keyword clusters derived from co-occurrence analysis.

Farmer's adaptation and market dynamics			Technological innovation and efficiency			Rice value chain governance			Food security and policy			Consumer behavior and sustainability		
Keyword	Occ	TLS	Keyword	Occ	TLS	Keyword	Occ	TLS	Keyword	Occ	TLS	Keyword	Occ	TLS
farmer	6	15	rice value chain	19	26	value chain	24	62	food security	7	20	rice	26	60
ghana	4	9	circular economy	3	3	contract farming	8	25	west africa	7	13	sustainability	4	11
market access	4	12	digital technology	3	4	africa	5	19	system dynamics	5	8	value chain upgrading	4	7
vietnam	4	9	milling	3	13	upgrading	4	12	agrifood value chain	4	5	experimental auctions	3	7
adoption	3	5	sub-saharan africa	3	5	vertical coordination	3	11	impact	3	7	quality	3	9
agrifood systems	3	8	water management	3	8	governance	2	9	organic rice	3	3	willingness to pay	3	7
climate change	3	7	benin	2	3	local rice	2	3	self-sufficiency	3	6	artificial neural network	2	1
multi-stakeholder partnerships	3	8	export	2	5	marketing models	2	5	food policy	2	4	choice experiment	2	4
network	3	7	innovation	2	6	nutrition	2	1	import substitution	2	4	markets	2	6
climate smart agriculture	2	5	kenya	2	5	policy	2	9	price transmission	2	3	multi-criteria decision analysis	2	4
cross border	2	5	multi-objective optimisation	2	3	senegal	2	11	value chain analysis	2	4	traceability	2	4
gender	2	3	post-harvest	2	4									
nigeria	2	3	product recovery	2	5									
participation	2	6	rice mill	2	4									
sustainable rice production	2	4	spatio-temporal modelling	2	2									
technological change	2	5	stochastic frontier analysis	2	4									
uganda	2	4	value web model	2	3									

Note: Occ is Occurrences and TLS is Total link strength. Source: Authors' elaboration.

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Conflict of interest

The authors declare no conflict of interest.

Author contributions

Conceptualization: SSn; Methodology: SSn, AW and JMMA; Software: All authors; Validation: SSn, AW and JMMA; Investigation: SSn and AW; Writing—original draft preparation: SSn and JMMA; Writing—review and editing: All authors; Visualization: AW; All authors have read and agreed to the published version of the manuscript.

References

1. Bin Rahman ANMR, Zhang J (2023) Trends in rice research: 2030 and beyond. *Food Energy Secur* 12: e390. https://doi.org/10.1002/fes3.390
2. Pede VO, Valera HG, Mishra AK, et al. (2024) Future of rice in Asia: Perspectives and opportunities, 2050. *Food Secur Issues Asia* 108: 108–138. https://doi.org/10.1142/9789811278297_0005
3. USDA (2025) Rice: Rice sector at a glance. Accessed on October 10, 2025, USDA Economic Research Service.
4. Shi M, Paudel KP, Chen F bo (2021) Mechanization and efficiency in rice production in China. *J Integr Agric* 20: 1996–2008. https://doi.org/10.1016/S2095-3119(20)63439-6
5. Chen B, Saghaian S (2016) Market integration and price transmission in theworld rice export markets. *J Agric Resour Econ* 41: 444–457.
6. Maertens M, Swinnen JFM (2009) Gender and modern supply chains in developing countries, LICOS Discussion Paper. https://doi.org/10.2139/ssrn.1360664
7. Toiba H, Maulana Noor AY, Rahman MS, et al. (2025) Farmers' preference for organic rice contract farming scheme: A discrete choice experiment in Indonesia. *J Environ Plan Manag* 68: 704–727. https://doi.org/10.1080/09640568.2023.2269308
8. Wahida, Toiba H, Umberger WJ, et al. (2013) Exploring indonesian consumers' willingness to pay for high-value agricultural products. *Acta Hortic* 1006: 397–404. https://doi.org/10.17660/ActaHortic.2013.1006.50
9. Purwandoko PB, Seminar KB, Sutrisno, et al. (2019) Development of a smart traceability system for the rice agroindustry supply chain in Indonesia. *Information* 10: 218. https://doi.org/10.3390/info10100288
10. Yakubu BM, Latif R, Yakubu A, et al. (2022) Rice chain: secure and traceable rice supply chain framework using blockchain technology. *PeerJ Comput Sci* 8: e801. https://doi.org/10.7717/peerj-cs.801

11. Chandio AA, Gokmenoglu KK, Ahmad M, et al. (2022) Towards sustainable rice production in Asia: The role of climatic factors. *Earth Syst Environ* 6: 1–14. https://doi.org/10.1007/s41748-021-00210-z
12. Aji JMM (2012) Rice supply chains in Indonesia: How do they work?. *Proceedings of International Conference on Agribusiness Marketing (ICAM), Jember, Indonesia*, 473–488.
13. Perdana T, Handayati Y, Sadeli AH, et al. (2020) A conceptual model of smart supply chain for managing rice industry. *Mimb J Sos & Pembang* 36: 128–138. https://doi.org/10.29313/mimbar.v36i1.5431
14. Gyawali P, Tamrakar D, Shrestha A, et al. (2022) Consumer acceptance and preference for brown rice: A mixed-method qualitative study from Nepal. *Food Sci Nutr* 10: 1864–1874. https://doi.org/10.1002/fsn3.2803
15. Yang X, Chen Q, Xu Z, et al. (2021) Consumers' preferences for health-related and low-carbon attributes of rice: A choice experiment. *J Clean Prod* 295: 126443. https://doi.org/10.1016/j.jclepro.2021.126443
16. Donthu N, Kumar S, Mukherjee D, et al. (2021) How to conduct a bibliometric analysis: An overview and guidelines. *J Bus Res* 133: 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070
17. Zupic I, Čater T (2015) Bibliometric methods in management and organization. *Organ Res Methods* 18: 429–472. https://doi.org/10.1177/1094428114562629
18. Khanra S, Dhir A, Kaur P, et al. (2021) Bibliometric analysis and literature review of ecotourism: Toward sustainable development. *Tour Manag Perspect* 37: 100777. https://doi.org/10.1016/j.tmp.2020.100777
19. Merigó JM, Mas-Tur A, Roig-Tierno N, et al. (2015) A bibliometric overview of the Journal of Business Research between 1973 and 2014. *J Bus Res* 68: 2645–2653. https://doi.org/10.1016/j.jbusres.2015.04.006
20. Shahidullah SM, Shirazy BJ, Rouf Sarkar MA, et al. (2024) Four decades of research on rice intercropping: A bibliometric analysis. *J Agric Food Res* 15: 100964. https://doi.org/10.1016/j.jafr.2024.100964
21. Yuan BZ, Sun J (2023) Research trend of rice and greenhouse gases based on Web of Science: A bibliometric analysis. *All Earth* 35: 16–30. https://doi.org/10.1080/27669645.2022.2164412
22. Sossa CLG, Sanogo S, Naab JB, et al. (2022) Trends and research features on greenhouse gas emissions from rice production: Review based on bibliometric analysis. *Environ Sci Pollut Res* 29: 73828–73841. https://doi.org/10.1007/s11356-022-22921-0
23. Nyakuma BB, Wong S, Mong GR, et al. (2021) Bibliometric analysis of the research landscape on rice husks gasification (1995–2019). *Environ Sci Pollut Res* 28: 49467–49490. https://doi.org/10.1007/s11356-021-15761-x
24. Zhang R, Hussain S, Yang S, et al. (2023) Research on salt stress in rice from 2000 to 2021: A Bibliometric analysis. *Sustainability* 15: 4512. https://doi.org/10.3390/su15054512
25. Suprehatin S (2025) Pemetaan tren dan arah riset rantai nilai kopi: Bibliometric dan content analysis (Mapping research trends and directions in the coffee value chain: A bibliometric and content analysis). *J Agribisnis Indones (Journal Indones Agribusiness)* 13: 144–156. https://doi.org/10.29244/jai.2025.13.1.144-156
26. Guan H, Huang TZ (2023) Rural tourism experience research: A bibliometric visualization review (1996–2021). *Tour Rev* 78: 761–777. https://doi.org/10.1108/TR-03-2022-0147

27. Gómez MI, Barrett CB, Buck LE, et al. (2011) Research principles for developing country food value chains. *Science* 332: 1154–1155. https://doi.org/10.1126/science.1202543
28. Barrett CB, Reardon T, Swinnen J, et al. (2022) Agri-food value chain revolutions in low- and middle-income countries. *J Econ Lit* 60: 1316–1377. https://doi.org/10.1257/jel.20201539
29. Feng Y, Zhu Q, Lai KH (2017) Corporate social responsibility for supply chain management: A literature review and bibliometric analysis. *J Clean Prod* 158: 296–307. https://doi.org/10.1016/j.jclepro.2017.05.018
30. Shaffril HAM, Krauss SE, Samsuddin SF (2018) A systematic review on Asian's farmers' adaptation practices towards climate change. *Sci Total Environ* 644: 683–695. https://doi.org/10.1016/j.scitotenv.2018.06.349
31. Muflikh YN, Smith C, Aziz AA (2021) A systematic review of the contribution of system dynamics to value chain analysis in agricultural development. *Agric Syst* 189: 103044. https://doi.org/10.1016/j.agsy.2020.103044
32. SudewoVRP, Suprehatin S, Utami AD (2023) Understanding studies on consumers' food choices using food choice questionnaire: A scoping review and bibliometric analysis (ScoRBA). *Agraris: J Agribusiness Rural Dev Res* 9: 238–257. https://doi.org/10.18196/agraris.v9i2.170
33. Wijaya A, Hermawan B (2025) BiblioPlot: Enhanced data visualization for bibliometric analysis. Available from: https//biblioplot metlit net.
34. Wahyoedi S, Hermawan B, Wijaya A, et al. (2024) Exploring trends and future paths in tourism villages research: An intellectual mapping. *J Ecohumanism* 3: 599–611. https://doi.org/10.62754/joe.v3i3.3359
35. Shafin N, Ismail CAN, Mustafa MZ, et al. (2022) Thematic analysis of multiple sclerosis research by enhanced strategic diagram. *Mult Scler J* 28: 2160–2170. https://doi.org/10.1177/13524585221075542
36. de Brauw A, Bulte E (2021) Economic theory and value chain governance. *African farmers, value chains and agricultural development: An economic and institutional perspective*, Springer, 39–58. https://doi.org/10.1007/978-3-030-88693-6_3
37. de Marchi V, Alford M (2022) State policies and upgrading in global value chains: A systematic literature review. *J Int Bus Policy* 5: 88–111. https://doi.org/10.1057/s42214-021-00107-8
38. Kilelu C, Klerkx L, Omore A, et al. (2017) Value chain upgrading and the inclusion of smallholders in markets: Reflections on contributions of multi-stakeholder processes in dairy development in Tanzania. *Eur J Dev Res* 29: 1102–1121. https://doi.org/10.1057/s41287-016-0074-z
39. Sridhar A, Ponnuchamy M, Kumar PS, et al. (2023) Digitalization of the agro-food sector for achieving sustainable development goals: A review. *Sustain Food Technol* 1: 783–802. https://doi.org/10.1039/D3FB00124E
40. Vahdanjoo M, Sørensen CG, Nørremark M (2025) Digital transformation of the agri-food system. *Curr Opin Food Sci* 63: 101287. https://doi.org/10.1016/j.cofs.2025.101287
41. Gonçalves C, Fernandes J, Brites C (2025) Blockchain-enabled traceability in the rice supply chain: Insights from the TRACE-RICE Project. *Foods* 14: 3711. https://doi.org/10.3390/foods14213711
42. Sanusi MS, Mayokun OM, Sunmonu MO, et al. (2025) Transformative trends: Commercial platforms revolutionizing rice farming in Nigeria's agricultural value chain. *Int J Agric Sustain* 23: 2473757. https://doi.org/10.1080/14735903.2025.2473757

43. Kirchherr J, Reike D, Hekkert M (2017) Conceptualizing the circular economy: An analysis of 114 definitions. *Resour Conserv Recycl* 127: 221–232. https://doi.org/10.1016/j.resconrec.2017.09.005
44. Vaskalis I, Skoulou V, Stavropoulos G, et al. (2019) Towards circular economy solutions for the management of rice processing residues to bioenergy via gasification. *Sustainability* 11: 6433. https://doi.org/10.3390/su11226433
45. Odewole MM, Sanusi MS, Sunmonu MO, et al. (2024) Digitalization of rice value chain in Nigeria with circular economy inclusion for improved productivity: A review. *Heliyon* 10: e31611. https://doi.org/10.1016/j.heliyon.2024.e31611
46. Geissdoerfer M, Savaget P, Bocken NMP, et al. (2017) The circular economy: A new sustainability paradigm? *J Clean Prod* 143: 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048
47. Asgari A, Asgari R (2021) How circular economy transforms business models in a transition towards circular ecosystem: The barriers and incentives. *Sustain Prod Consum* 28: 566–579. https://doi.org/10.1016/j.spc.2021.06.020
48. Lüdeke-Freund F, Gold S, Bocken NMP (2019) A review and typology of circular economy business model patterns. *J Ind Ecol* 23: 36–61. https://doi.org/10.1111/jiec.12763
49. Chamberlain W, Anseeuw W (2019) Inclusive businesses in agriculture: Defining the concept and its complex and evolving partnership structures in the field. *Land Use Policy* 83: 308–322. https://doi.org/10.1016/j.landusepol.2019.02.008
50. Ochi A, Labidi MA, Saidi Y (2024) The nexus between pro-poor growth, inequality, institutions and poverty: Evidence from low and middle income developing countries. *Soc Indic Res* 172: 703–739. https://doi.org/10.1007/s11205-024-03326-7
51. Schoneveld GC (2020) Sustainable business models for inclusive growth: Towards a conceptual foundation of inclusive business. *J Clean Prod* 277: 124062. https://doi.org/10.1016/j.jclepro.2020.124062
52. Bennett EA, Grabs J (2025) How can sustainable business models distribute value more equitably in global value chains? Introducing "value chain profit sharing" as an emerging alternative to fair trade, direct trade, or solidarity trade. *Bus Ethics, Environ Responsib* 34: 581–601. https://doi.org/10.1111/beer.12666
53. Maryono M, Killoes AM, Adhikari R, et al. (2024) Agriculture development through multi-stakeholder partnerships in developing countries: A systematic literature review. *Agric Syst* 213: 103792. https://doi.org/10.1016/j.agsy.2023.103792
54. Barrett CB, Bachke ME, Bellemare MF, et al. (2012) Smallholder participation in contract farming: Comparative evidence from five countries. *World Dev* 40: 715–730. https://doi.org/10.1016/j.worlddev.2011.09.006
55. Hemming DJ, Chirwa EW, Dorward A, et al. (2018) Agricultural input subsidies for improving productivity, farm income, consumer welfare and wider growth in low- and lower-middle-income countries: A systematic review. *Campbell Syst Rev* 14: 1–153. https://doi.org/10.4073/csr.2018.4
56. Ruml A, Ragasa C, Qaim M (2022) Contract farming, contract design and smallholder livelihoods. *Aust J Agric Resour Econ* 66: 24–43. https://doi.org/10.1111/1467-8489.12462
57. Dawe D, Timmer CP (2012) Why stable food prices are a good thing: Lessons from stabilizing rice prices in Asia. *Glob Food Sec* 1: 127–133. https://doi.org/10.1016/j.gfs.2012.09.001
58. Walls HL, Johnston D, Tak M, et al. (2018) The impact of agricultural input subsidies on food and nutrition security: A systematic review. *Food Secur* 10: 1425–1436. https://doi.org/10.1007/s12571-018-0857-5

59. Ba HA, de Mey Y, Thoron S, et al. (2019) Inclusiveness of contract farming along the vertical coordination continuum: Evidence from the Vietnamese rice sector. *Land use policy* 87: 104050. https://doi.org/10.1016/j.landusepol.2019.104050
60. Tuyen MC, Hung PX (2025) Factors affecting contract farming enforcement in rice production in Vietnam. In: Kostavelis I, Folinas D, Aidonis D, et al. (Eds.), Cham, Springer Nature Switzerland, 237–250. https://doi.org/10.1007/978-3-031-69351-9_21
61. Allen S, de Brauw A (2018) Nutrition sensitive value chains: Theory, progress, and open questions. *Glob Food Sec* 16: 22–28. https://doi.org/10.1016/j.gfs.2017.07.002
62. Donovan J, Gelli A (2019) Designing interventions in local value chains for improved health and nutrition: Insights from Malawi. *World Dev Perspect* 16: 100149. https://doi.org/10.1016/j.wdp.2019.100149
63. Pingali P, Sunder N (2017) Transitioning toward nutrition-sensitive food systems in developing countries. *Annu Rev Resour Econ* 9: 439–459. https://doi.org/10.1146/annurev-resource-100516-053552
64. Thakur AK, Uphoff NT (2017) How the system of rice intensification can contribute to climate-smart agriculture. *Agron J* 109: 1163–1182. https://doi.org/10.2134/agronj2016.03.0162
65. Azadi H, Movahhed Moghaddam S, Burkart S, et al. (2021) Rethinking resilient agriculture: From climate-smart agriculture to vulnerable-smart agriculture. *J Clean Prod* 319: 128602. https://doi.org/10.1016/j.jclepro.2021.128602
66. Davis B, Lipper L, Winters P (2022) Do not transform food systems on the backs of the rural poor. *Food Secur* 14: 729–740. https://doi.org/10.1007/s12571-021-01214-3
67. Claeys P, Desmarais AA, Singh J (2021) Food sovereignty, food security and the right to food. *Handb Crit Agrar Stud* 238–249. https://doi.org/10.4337/9781788972468.00035
68. Sommerville M, Essex J, Le Billon P (2014) The 'Global food crisis' and the geopolitics of food security. *Geopolitics* 19: 239–265. https://doi.org/10.1080/14650045.2013.811641
69. Vidergar P, Perc M, Lukman RK (2021) A survey of the life cycle assessment of food supply chains. *J Clean Prod* 286. https://doi.org/10.1016/j.jclepro.2020.125506

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