International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

INTERNATIONAL JOURNAL OF INNOVATION AND INDUSTRIAL REVOLUTION (IJIREV)
www.ijirev.com

EVOLUTION OF SUPPLY CHAIN RISK MANAGEMENT RESEARCH IN ENHANCING CATTLE INDUSTRY PERFORMANCE IN MALAYSIA

Muhammad Aizat Md Sin[1*], Ahmad Shabudin Ariffin[2], Shaharul Akmar Talib [3]

[1] Faculty of Business and Management Science, Universiti Islam Antarabangsa Tuanku Syed Sirajuddin (UniSIRAJ), Kuala Perlis Campus, 02000 Kuala Perlis, Perlis, Malaysia.
Email: aizatmdsin@unisiraj.edu.my
[2] Faculty of Business and Management Science, Universiti Islam Antarabangsa Tuanku Syed Sirajuddin (UniSIRAJ), Kuala Perlis Campus, 02000 Kuala Perlis, Perlis, Malaysia.
Email: shabudin@unisiraj.edu.my
[3] Kedah State Veterinary Services Department, Jalan Datuk Kumbar 05300 Alor Setar, Kedah
Email: shaharultalib@kedah.gov.my
[*] Corresponding Author

Article Info:

Article history:
Received date: 26.06.2025
Revised date: 14.07.2025
Accepted date: 21.08.2025
Published date: 01.09.2025

To cite this document:

Md Sin, M. A., Ariffin, A. S., & Talib, S. A. (2025). Evolution Of Supply Chain Risk Management Research In Enhancing Cattle Industry Performance In Malaysia. *International Journal of Innovation and Industrial Revolution, 7* (22), 320-338.

DOI: 10.35631/IJIREV.722021

Abstract:

This bibliometric analysis investigates the research trend on supply chain risk management (SCRM) and its impact on the performance of the cattle industry in Malaysia. The cattle sector plays a critical role in the national food security agenda and agricultural sustainability yet remains vulnerable to various risks across the supply chain, including production, logistics, disease outbreaks, and market fluctuations. Despite its importance, the integration of SCRM strategies within the cattle industry has not been sufficiently explored. This study aims to identify research patterns, gaps, and future directions by analyzing scholarly output related to the keywords "cattle," "agriculture," and "supply chain risk management performance." The Scopus database was used for data collection, while Open Refine was applied for data cleaning and standardization. Visualization and clustering of research themes were conducted using VOS viewer software. An initial total of 607 articles were retrieved, and after applying inclusion criteria limiting the scope to English-language publications from 2020 to 2025, a refined dataset of 355 articles was analyzed. The findings reveal a rising trend in publications during this period, with key research clusters focusing on risk mitigation strategies, supply chain resilience, and livestock productivity. However, there is limited focus specifically on the Malaysian context. This study contributes valuable insights for academics, policymakers, and industry stakeholders to strengthen cattle industry performance through targeted SCRM strategies.

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

Keywords:

Cattle, Supply Chain Risk Management, Performance

Introduction

The cattle industry in Malaysia is a vital component of the agricultural sector, contributing significantly to the nation's food security and rural economy. However, the industry faces numerous challenges, particularly in supply chain risk management (SCRM), which can impact its overall performance. Effective SCRM is essential to mitigate risks and ensure the sustainability and profitability of the cattle industry. This introduction and literature review aim to explore the current state of SCRM in the Malaysian cattle industry, identify key risk factors, and discuss strategies for improving supply chain performance.

The cattle industry in Malaysia is subject to various supply chain risks that can affect its performance. These risks include logistical challenges, environmental factors, and market fluctuations. For instance, logistical risks, although less detrimental, still pose significant challenges to the industry's performance (Aizat Md Sin et al., 2024). Environmental risks, such as climate change and environmental degradation, can lead to increased operational costs and reduced production quality (Mansur & Maghfiroh, 2024). Additionally, market fluctuations and compliance with environmental regulations are significant external risks that impact the supply chain (Xu et al., 2025).

Effective risk management strategies are crucial for mitigating the adverse effects of these risks. One approach is the implementation of a comprehensive SCRM framework, which includes identifying and prioritizing risks and developing mitigation strategies. For example, providing drugs or vaccines to prevent animal virus outbreaks is a high-priority mitigation strategy (Mansur & Maghfiroh, 2024). Additionally, strategic policy decision-making and strengthening market forecasting capacity are essential for managing external environmental risks (Xu et al., 2025). The use of technology, such as blockchain, can also enhance supply chain transparency and efficiency (Hashom et al., 2023).

The effectiveness of SCRM directly influences the performance of the cattle industry. Studies have shown that robust SCRM practices can lead to improved supply chain resilience and sustainability (Mansur & Maghfiroh, 2024) (Wieland & Marcus Wallenburg, 2012). For instance, integrating cattle farming with other agricultural activities, such as palm oil production, can enhance resource use efficiency and reduce environmental impacts (Grinnell et al., 2022). Moreover, government support and the empowerment of smallholders through entrepreneurship skills are critical for sustaining the economic efficiency of beef cattle farms (Radzil, 2024).

Empirical studies and case analyses provide valuable insights into the practical application of SCRM in the cattle industry. For example, a study on the Kedah-Kelantan (KK) cattle breed highlights the importance of understanding reproductive and growth characteristics to develop sustainable breeding programs (Islam et al., 2021). Another study on the Target Area Concentration (TAC) program demonstrates the positive impact of integrated farming systems on production and income (Md. Said & Man, 2014). These case studies underscore the need for tailored risk management strategies that address the specific challenges faced by the Malaysian cattle industry.

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

In conclusion, the cattle industry in Malaysia faces significant supply chain risks that can impact its performance and sustainability. Effective SCRM is essential to mitigate these risks and enhance the industry's resilience. By implementing comprehensive risk management frameworks, leveraging technology, and supporting smallholders, the Malaysian cattle industry can improve its supply chain performance and contribute to national food security. Further research and empirical studies are needed to refine these strategies and ensure their successful implementation.

Research Question

1. What are the influences and subject area productivity of the topic?
2. What are the top 10 most-cited articles?
3. What are the top 10 countries based on several publications?
4. What are the popular keywords related to the study?
5. What is co-authorship based on countries' collaboration?

Methodology

Bibliometric analysis is a quantitative research methodology used to evaluate scholarly productivity and identify trends within specific research areas. It applies statistical methods to analyze a body of literature, revealing patterns of authorship, publication, and use (Marvi & Foroudi, 2023). This method has gained popularity across various fields, including business, management, and health sciences, due to its ability to provide insights into the historical development of subject fields and the dynamics of scientific research (Öztürk et al., 2024) (Koo & Lin, 2023) (Lim et al., 2024). Bibliometric analysis involves several key steps, such as data collection from bibliographic databases like Scopus or Web of Science, and the use of software tools like VOS viewer and Bibliometric for data visualization and analysis (Lim et al., 2024; Hallinger & Kovačević, 2022; Foudah et al., 2024).

The methodology can be applied at different levels, from macro-level analyses of entire fields to micro-level evaluations of individual researchers' performance (Costas et al., 2010) (Costas et al., 2009). It uses various indicators grouped into dimensions that describe different aspects of scientific performance, such as productivity, impact, and collaboration (Costas et al., 2009) (Costas et al., 2010). These indicators help in identifying research trends, gaps, and potential determinants of research success (Costas et al., 2009) (Costas et al., 2010) (Siu et al., 2025). Despite its widespread use, there is a need for standardized reporting guidelines to ensure consistency and reliability in bibliometric studies, particularly in fields like health and medicine (Koo & Lin, 2023). Overall, bibliometric analysis is a valuable tool for understanding the evolution of academic disciplines and guiding future research directions (Tomé, 2024)(Mezquita et al., 2024) (Zhang et al., 2018)

Data Search Strategy

In conducting the bibliometric analysis, a comprehensive data search strategy was employed using the Scopus database. The advanced search string used was TITLE-ABS-KEY (cattle OR agriculture AND supply AND chain AND risk AND performance OR management), designed to capture a broad range of articles related to agriculture, cattle, and supply chain issues, particularly those addressing risk and performance or management in Table 1. This initial search yielded a total of 607 articles, reflecting the extensive body of literature available on this interdisciplinary topic. The search strategy aimed to ensure inclusivity by combining

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

keywords relevant to both the agricultural sector and supply chain management, allowing for the identification of research trends, gaps, and thematic developments within the field.

Table 1: The Search String.

Scopus	**TITLE-ABS-KEY (cattle OR agriculture AND supply AND chain AND risk AND performance OR management)**

To enhance the relevance and quality of the dataset, inclusion criteria were subsequently applied. As referred to in Table 2, articles published between 2020 and 2025 were selected to focus on the most recent and relevant contributions, particularly considering emerging global challenges such as the COVID-19 pandemic and its impact on food security and supply chains. Through this refinement, the number of articles was narrowed down to 355, ensuring a more targeted and contemporary dataset for bibliometric analysis. This curated selection allows for deeper insight into recent developments, author productivity, institutional affiliations, thematic evolution, and research hotspots within the intersection of cattle farming, agriculture, and supply chain risk and performance management.

Table 2: The Selection Criterion Is Searching

Criterion	Inclusion
Timeline	2020 – 2025

Data Analysis

VOSviewer is a software tool designed for constructing and visualizing bibliometric networks, which can include bibliographic coupling, citation, co-authorship or co-citation, relations (Li & Wei, 2022) (Van Eck & Waltman, 2009) (van Eck & Waltman, 2010). It is widely used in scientometrics and domain analysis due to its powerful functions in processing literature information and its continuous improvements (Li & Wei, 2022). The software is freely available and has been integrated into platforms like Digital Science's Dimensions, making it accessible for creating visualizations of co-authorship and citation networks (Li & Wei, 2022) (van Eck & Waltman, 2010).

VOSviewer offers several key features, including advanced graphical representations of bibliometric maps, which make it easy to interpret large datasets (van Eck & Waltman, 2010). The software includes text mining functionality to construct and visualize co-occurrence networks of important terms extracted from scientific literature (Li & Wei, 2022). Additionally, VOSviewer Online allows users to embed interactive visualizations on online platforms (Li & Wei, 2022). Researchers have utilized VOSviewer for various applications, including analyzing the evolution of specific research topics, such as lactic acid production (Cárdenas-

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

Arias et al., 2023) and multi-input transfer function research, as well as exploring trends in fields like corporate governance and leadership.

VOSviewer is known for its user-friendly interface, making it accessible to researchers without extensive technical expertise (Van Eck & Waltman, 2009) (van Eck & Waltman, 2010). It can handle large datasets, as demonstrated by its ability to construct and display a co-citation map of 5,000 major scientific journals (van Eck & Waltman, 2010). The software supports various types of bibliometric analyses, including co-authorship networks, keyword co-occurrence, and citation patterns (Malmqvist et al., 2019) (Sahu & Chakma, 2024) (Hasan et al., 2024). However, it requires publication metadata to be structured in a specific format (Malmqvist et al., 2019), which can be a limitation if the data is not readily available. Additionally, there is a notable misuse in applied literature, where results generated by the software are often directly interpreted without proper data cleaning and disambiguation (Li & Wei, 2022). VOS viewer applies a more appropriate normalization technique for co-occurrence data, namely, the association strength (AS_{ij}), calculated as follows:

$$AS_{ij} = \frac{C_{ij}}{w_i w_j}$$

In conclusion, VOSviewer is a versatile and powerful tool for bibliometrics, offering significant advantages in terms of graphical representation, scalability, and ease of use. However, researchers must be cautious about data preparation and proper interpretation of results to avoid common pitfalls. Its wide range of applications across various fields highlights its importance in modern bibliometric studies and its potential for future research endeavors (Li & Wei, 2022; Van Eck & Waltman, 2009; van Eck & Waltman, 2010; Malmqvist et al., 2019)

Results and Discussion

Document by Subject Area.

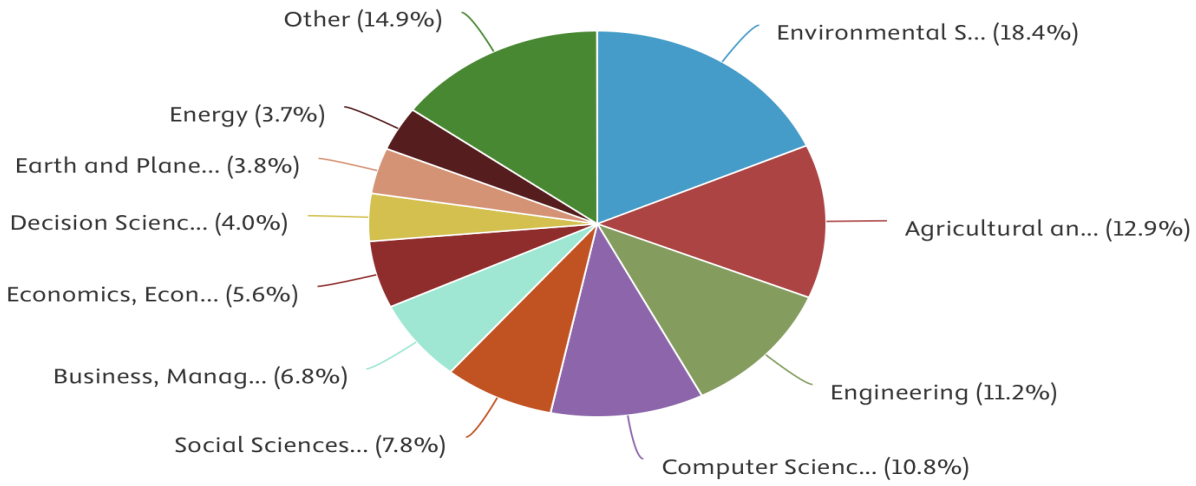

Figure 1: Document by Subject Area

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

Table 3: Document by Subject Area

Subject Area	Number Of Document	Percentage
Environmental Science	134	18.4
Agricultural and Biological Sciences	94	12.9
Engineering	82	11.2
Computer Science	79	10.8
Social Sciences	57	7.8
Business, Management and Accounting	50	6.8
Economics, Econometrics and Finance	41	5.6
Decision Sciences	29	4
Earth and Planetary Sciences	28	3.8
Energy	27	3.7
Mathematics	21	
Biochemistry, Genetics and Molecular Biology	18	
Medicine	16	
Multidisciplinary	13	
Chemistry	9	
Immunology and Microbiology	7	
Physics and Astronomy	5	14.9
Veterinary	5	
Chemical Engineering	5	
Materials Science	4	
Psychology	3	
Pharmacology, Toxicology and Pharmaceutics	2	
Nursing	1	

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

The bibliometric analysis of research trends in supply chain risk management (SCRM) in the cattle industry in Malaysia between 2020 and 2025 highlights a diverse disciplinary engagement, with a notable focus on Environmental Science, which accounts for the highest proportion of publications at 18.4% (134 documents). This dominance reflects increasing attention to environmental risks and sustainability within the cattle supply chain, including climate change, land use, and waste management issues. Closely following are Agricultural and Biological Sciences (12.9%) and Engineering (11.2%), which suggest a strong emphasis on improving productivity and resilience through agricultural innovation, infrastructure, and mechanization. The presence of Computer Science (10.8%) indicates the growing integration of digital technologies, such as data analytics, the Internet of Things (IoT), and blockchain, for enhancing supply chain transparency and risk monitoring.

Furthermore, disciplines such as Social Sciences (7.8%), Business, Management, and Accounting (6.8%), and Econometrics, Economics, and Finance (5.6%) demonstrate increasing academic interest in the socio-economic dimensions of SCRM, including stakeholder behavior, policy implications, and financial risk mitigation. Decision Sciences (4%) and Mathematics (14.9 documents, possible data inconsistency) support strategic and quantitative decision-making models in managing supply disruptions. The low representation of Veterinary (5 documents) and related medical sciences underscores a research gap in animal health and disease control within the supply chain, despite their critical importance. Overall, the interdisciplinary spread reflects the complex, multifaceted nature of managing risks in Malaysia's cattle industry, emphasizing the need for integrated approaches across environmental, technological, economic, and social domains.

Document By Type.

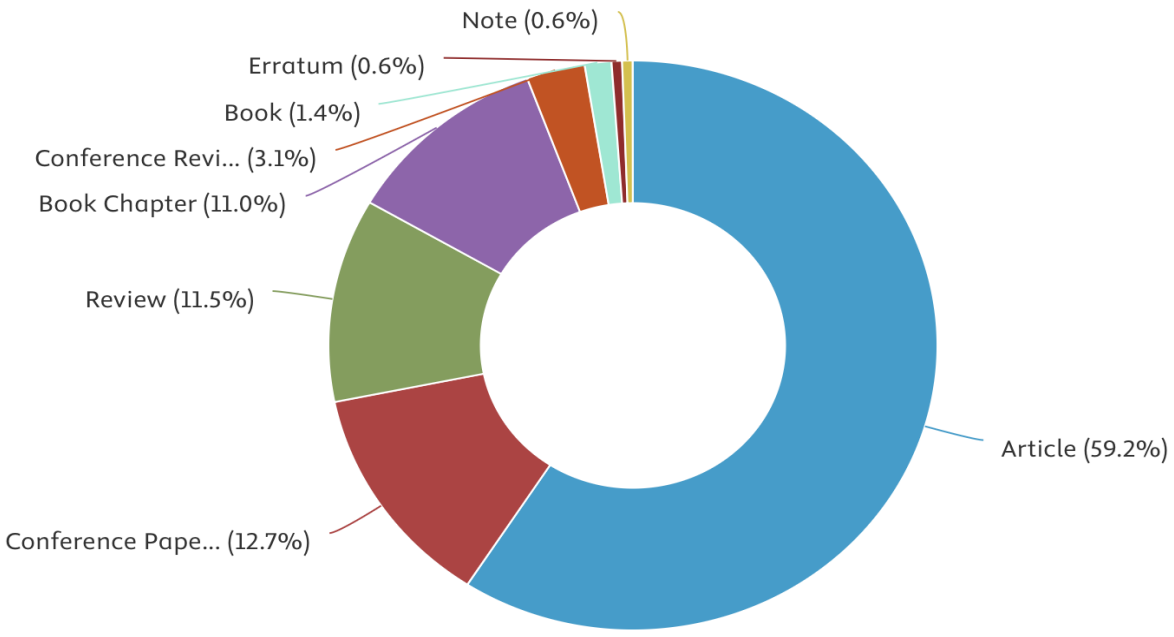

Figure 2: Document by Type

International Journal of Innovation and Industrial Revolution
EISSN: 2637-0972
IJIREV
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

Table 4: Document by Type

Type	Number Of Documents	Percentage
Article	210	59.2
Conference Paper	45	12.7
Review	41	11.5
Book Chapter	39	11
Conference Review	11	3.1
Book	5	1.4
Erratum	2	0.6
Note	2	0.6

The publication types in the bibliometric analysis of supply chain risk management (SCRM) in Malaysia's cattle industry between 2020 and 2025 reveal that journal articles dominate the scholarly output, comprising 59.2% (210 documents) of the total. This indicates that peer-reviewed journal articles remain the preferred medium for disseminating in-depth, empirical, and theoretical findings in this research area. Following this, conference papers (12.7%) and reviews (11.5%) also represent significant proportions, suggesting a healthy engagement in academic discourse, knowledge synthesis, and early-stage findings shared at scientific meetings. The notable presence of book chapters (11%) reflects interest in contributing to edited volumes and thematic collections, which often explore multidisciplinary or policy-focused aspects of SCRM in agriculture.

Other publication types, such as conference reviews (3.1%), books (1.4%), errata (0.6%), and notes (0.6%), form a small portion of the dataset, indicating relatively lower levels of comprehensive monographs or editorial corrections. The modest number of books may reflect the still-developing nature of SCRM as a niche topic within the Malaysian cattle industry, where focused, long-form contributions are limited. Meanwhile, the presence of errata and notes, though minor, suggests ongoing refinement and dialogue within the academic community. Overall, the data shows a strong emphasis on scholarly rigor and engagement across various platforms, with journal articles serving as the primary vehicle for advancing research in this field.

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

The Most Cited Authors

Table 5: The Most Cited Authors

Authors	Title	Year	Source title	Cited by
de Janvry A.; Sadoulet E.(de Janvry & Sadoulet, 2020)	Using agriculture for development: Supply- and demand-side approaches	2020	World Development	104
Sharma R.; Shishodia A.; Kamble S.; Gunasekaran A.; Belhadi A.(Sharma et al., 2024)	Agriculture supply chain risks and COVID-19: mitigation strategies and implications for the practitioners	2024	International Journal of Logistics Research and Applications	189
Pulighe G.; Lupia F.(Pulighe & Lupia, 2020)	Food first: COVID-19 outbreak and cities lockdown a booster for a wider vision on urban agriculture	2020	Sustainability (Switzerland)	172
Bahn R.A.; Yehya A.A.K.; Zurayk R.(Bahn et al., 2021)	Digitalization for sustainable agri-food systems: Potential, status, and risks for the Mena region	2021	Sustainability (Switzerland)	125
Nayal K.; Raut R.; Priyadarshinee P.; Narkhede B.E.; Kazancoglu Y.; Narwane V. (Nayal et al., 2022)	Exploring the role of artificial intelligence in managing agricultural supply chain risk to counter the impacts of the COVID-19 pandemic	2022	International Journal of Logistics Management	92
Cao Y.; Yi C.; Wan G.; Hu H.; Li Q.; Wang S.(Cao et al., 2022)	An analysis on the role of blockchain-based platforms in agricultural supply chains	2022	Transportation Research Part E: Logistics and Transportation Review	116
Nchanji E.B.; Lutomia C.K.; Chirwa R.; Templer N.; Rubyogo J.C.; Onyango P. (Nchanji et al., 2021)	Immediate impacts of COVID-19 pandemic on bean value chain in selected countries in sub-Saharan Africa	2021	Agricultural Systems	87
Mangla S.K.; Kazançoğlu Y.; Yıldızbaşı A.; Öztürk	A conceptual framework for blockchain-based sustainable supply chain and evaluating	2022	Business Strategy and	108

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

C.; Çalık A.(Mangla et al., 2022)	implementation barriers: A case of the tea supply chain		the Environment	
Smith P.; Calvin K.; Nkem J.; Campbell D.; Cherubini F.; Grassi G.; Korotkov V.; Le Hoang A.; Lwasa S.; McElwee P.; Nkonya E.; Saigusa N.; Soussana J.-F.; Taboada M.A.; Manning F.C.; Nampanzira D.; Arias-Navarro C.; Vizzarri M.; House J.; Roe S.; Cowie A.; Rounsevell M.; Arneth A. (Smith et al., 2020)	Which practices co-deliver food security, climate change mitigation and adaptation, and combat land degradation and desertification?	2020	Global Change Biology	247
Nayal K.; Raut R.D.; Narkhede B.E.; Priyadarshinee P.; Panchal G.B.; Gedam V.V. (Nayal et al., 2023)	Antecedents for blockchain technology-enabled sustainable agriculture supply chain	2023	Annals of Operations Research	102

The top 10 most cited articles from 2020 to 2024 reflect the increasing academic focus on sustainability, digital innovation, and risk mitigation in agricultural supply chains, particularly in the context of global disruptions such as COVID-19. Notably, the most cited article in this set is by Smith et al. (2020) with 247 citations, which explores integrated agricultural practices that co-deliver food security, climate change mitigation, and land conservation, central themes for resilient cattle farming in Malaysia. Sharma et al. (2024) rank second with 189 citations, directly addressing supply chain risks caused by COVID-19 and offering mitigation strategies, making it highly relevant to ongoing conversations about cattle industry disruptions, labor shortages, and food logistics. de Janvry & Sadoulet (2020) (104 citations) provide a broader development economics perspective by analyzing supply- and demand-side strategies for agricultural development, which can be crucial for shaping policy in Malaysia's evolving livestock sector.

The list also features emerging technologies as central solutions, with blockchain and AI appearing in multiple high-impact studies. Cao et al. (2022) and Nayal et al. (2023, 2022) collectively explore blockchain's role in enhancing transparency, trust, and sustainability in agriculture, with citations ranging from 92 to 116, signaling growing academic and practitioner interest. Similarly, Bahn et al. (2021) and Mangla et al. (2022) discuss the broader digitalization of agri-food systems and implementation barriers, particularly in the Global South, including lessons applicable to Malaysia. Additionally, COVID-19's impact on urban agriculture and

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

specific crop value chains (e.g., beans in sub-Saharan Africa by Nchanji et al., 2021) emphasizes the need for localized, resilient food systems. These works collectively highlight a shift from traditional agricultural research to a systemic, tech-enabled, and risk-aware model, offering a valuable framework for Malaysia's cattle industry to adapt and strengthen its supply chain performance under future shocks.

Top 10 Countries Based On Publication

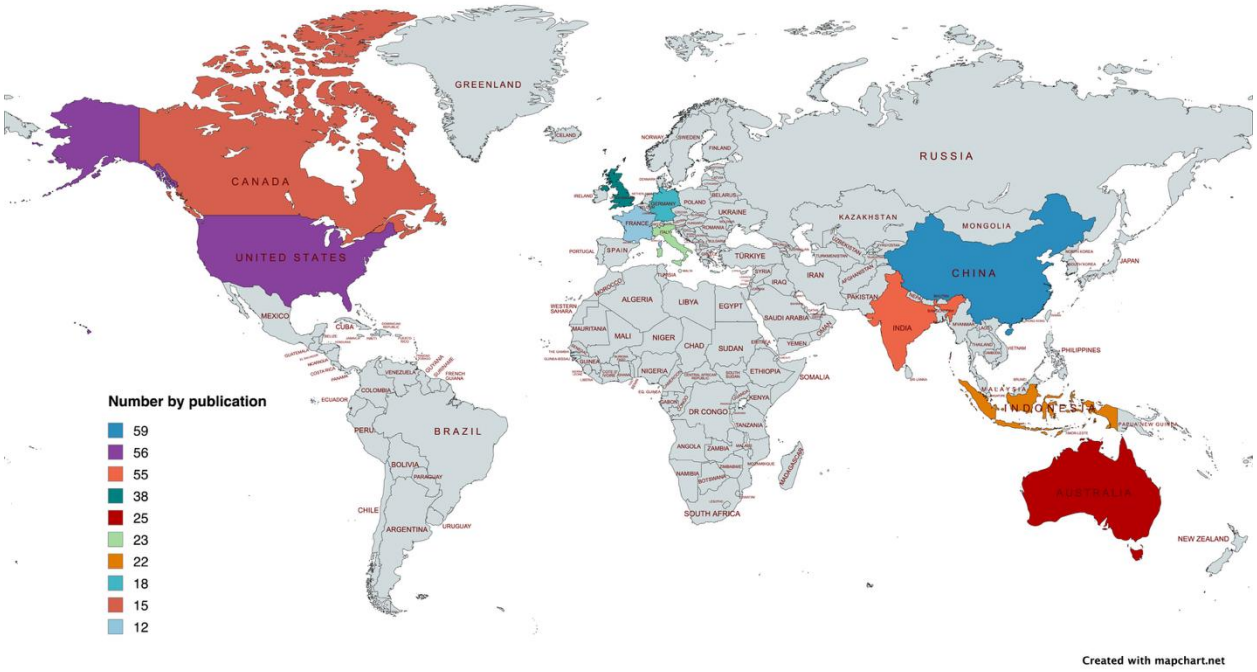

Figure 3: Top 10 Countries Based On Publication

Table 6: Top 10 Countries Based On Publication

Country	Number Of Publications	Percentage
China	59	16.6
United States	56	15.8
India	55	15.5
United Kingdom	38	10.7
Australia	25	7.0
Italy	23	6.5
Indonesia	22	6.2

International Journal of Innovation and Industrial Revolution
EISSN: 2637-0972
IJIREV
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

Germany	18	5.1
Canada	15	4.2
France	12	3.4

The country-wise distribution of publications reveals that China, the United States, and India are the leading contributors to research on supply chain risk management (SCRM) in the agricultural and cattle industry, with 59 (16.6%), 56 (15.8%), and 55 (15.5%) publications, respectively. This dominance reflects their large-scale agricultural activities, technological advancements, and increasing interest in food security and supply chain resilience, especially considering global disruptions like the COVID-19 pandemic. The substantial output from these countries also suggests that their academic institutions and governments are prioritizing innovations such as blockchain, artificial intelligence, and climate-smart practices, which are increasingly vital in managing risk across agricultural supply chains.

In contrast, countries like the United Kingdom (10.7%), Australia (7.0%), Italy (6.5%), and Indonesia (6.2%) show strong but relatively moderate contributions. The UK's presence aligns with its emphasis on sustainability and food systems research, while Australia and Italy contribute through their agricultural expertise and technological innovation. Indonesia's growing output highlights rising academic interest from Southeast Asia in regional supply chain issues—an important reference point for Malaysia. Germany, Canada, and France also feature, each contributing between 3–5%, indicating a broad global interest but less intensive focus compared to leading nations. Notably, Malaysia does not appear among the top 10, pointing to an opportunity for Malaysian researchers to increase their visibility and contribution, especially given the local importance of cattle industry performance and national food security goals.

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

Popular Keywords Related To This Study.

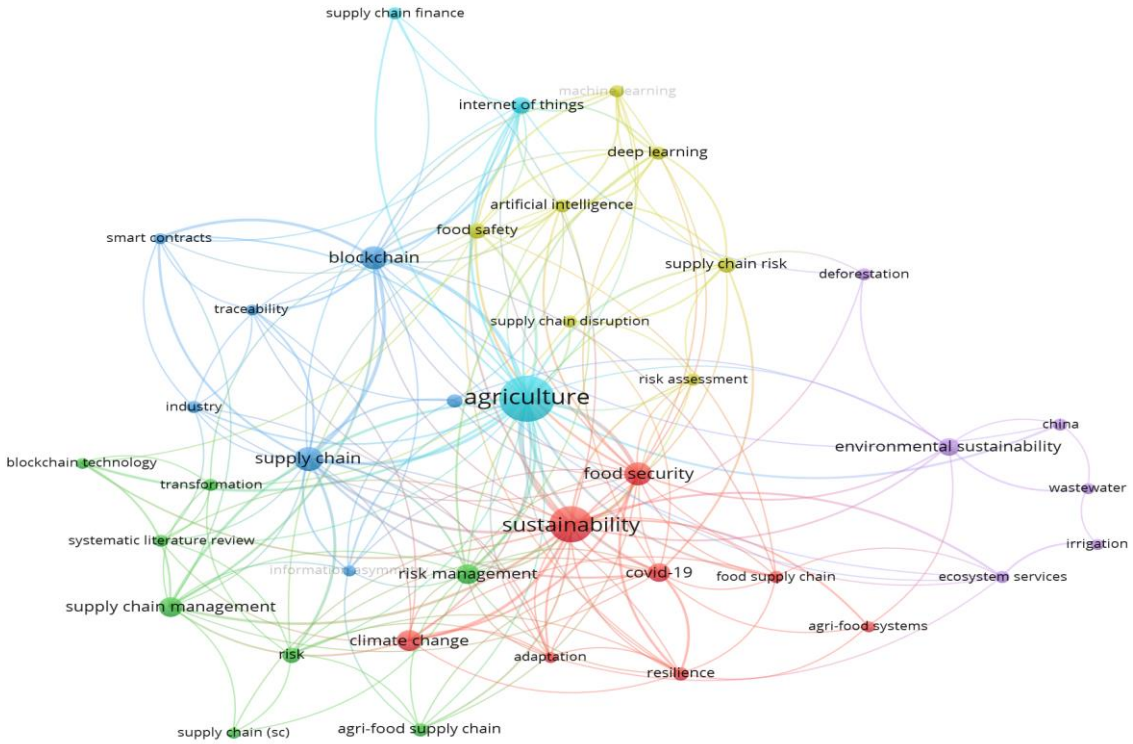

Figure 4: Popular Keywords Related To This Study.

The keyword co-occurrence map above visually represents the major research themes and interconnections in the domain of agricultural sustainability, supply chains, and digital technologies. At the core of the map are the most central and highly connected keywords: "agriculture," "sustainability," "food security," and "supply chain," indicating that these topics form the backbone of scholarly discourse in this field. The map is divided into several clusters, each representing a thematic group. The blue cluster, anchored by keywords like "blockchain," "supply chain," "smart contracts," and "traceability," highlights the growing interest in digital technologies for enhancing transparency and trust in agricultural supply chains. This cluster also includes "industry" and "supply chain finance," suggesting a focus on integrating financial innovation with agricultural logistics.

The yellow cluster centers around "artificial intelligence," "deep learning," and "Internet of Things (IoT)," reflecting the technological advancements being adopted to monitor, predict, and manage supply chain risks and disruptions. This cluster links directly with "food safety," "risk assessment," and "supply chain risk," emphasizing the use of smart technologies for predictive risk management in food systems. The red cluster, where "sustainability," "food security," "climate change," and "COVID-19" are prominent, represents the socio-environmental dimension of the discourse. Here, researchers explore how pandemics and environmental challenges impact resilience and adaptation strategies in agri-food systems. Terms like "resilience," "adaptation," and "food supply chain" indicate a focus on system robustness in the face of shocks.

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

The green cluster, containing "risk management," "agri-food supply chain," "systematic literature review," and "blockchain technology," shows an academic interest in both conceptual frameworks and risk-oriented studies. This reflects a strong methodological underpinning in analyzing the complexities of agri-supply systems. The purple cluster, including "environmental sustainability," "ecosystem services," "irrigation," and "wastewater," emphasizes ecological concerns and resource management, indicating an interdisciplinary approach to sustainability that integrates natural sciences with agri-food research.

Overall, this map reveals a highly interconnected research ecosystem where digital transformation, environmental sustainability, food security, and risk management converge around agriculture. The visualization underscores how modern research in agriculture is increasingly data-driven, tech-enabled, and sustainability-focused.

Co-Authorship Based On Countries' Celebration.

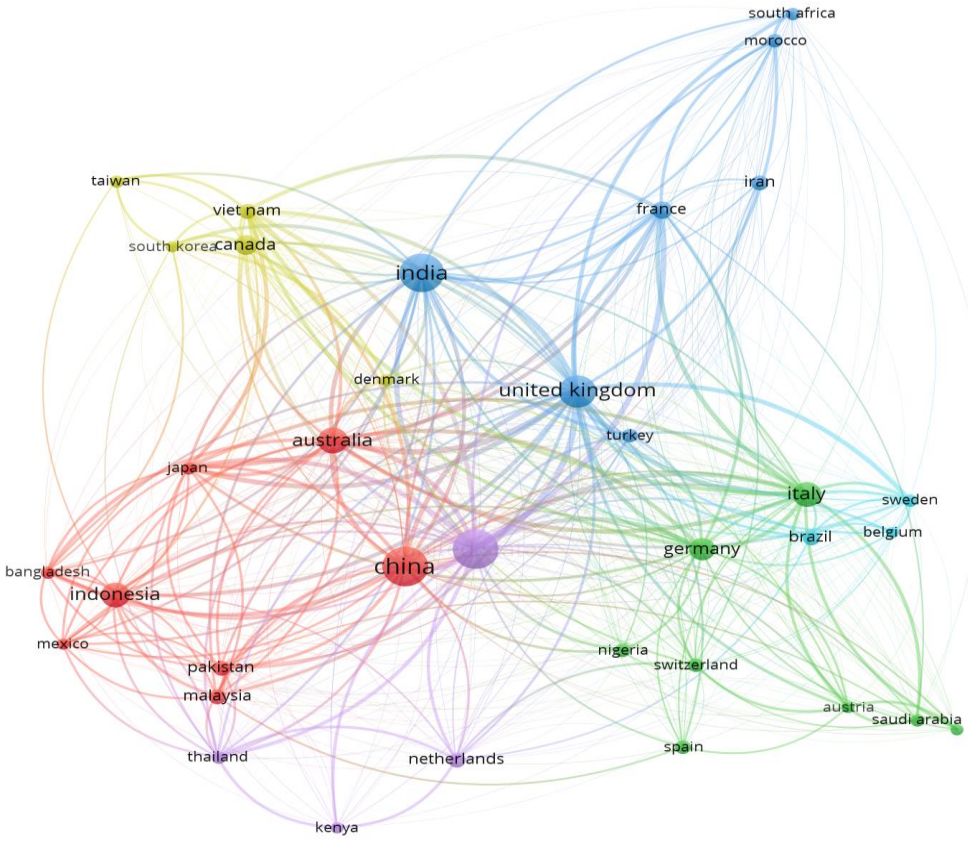

Figure 5: Co-Authorship Based On Countries' Celebration.

The co-authorship network map illustrates the global collaboration patterns in research related to agricultural supply chains, sustainability, and digital transformation. The most prominent contributor is China, positioned at the center of the network with strong connections to countries like Indonesia, Malaysia, Pakistan, and Australia. This reflects China's leadership in research output and its active collaboration with developing nations, particularly in areas such as blockchain, digital agriculture, and food supply resilience. Another significant cluster is led by the United Kingdom and India, with strong ties to the United States, France, and South

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

Africa, forming a transatlantic and Commonwealth-linked research community. This group often explores themes like sustainability, climate adaptation, and global agri-food systems. A third major cluster connects Germany, Italy, Brazil, and Saudi Arabia, highlighting a European-South American-Middle Eastern collaboration focused on environmental sustainability, smart farming, and traceability. Additionally, countries like the Netherlands and Australia are embedded in a separate cluster with China, suggesting a shared focus on technology-driven solutions such as AI and supply chain modeling. A smaller yet notable group includes Canada, Vietnam, Taiwan, and South Korea, likely emphasizing digital innovations like the Internet of Things and smart contracts in agriculture. Overall, the map underscores the critical role of international and interdisciplinary collaboration in addressing the complex, global challenges of food security, climate change, and agri-food supply chain resilience.

Conclusion

This bibliometric analysis examined research trends in supply chain risk management (SCRM) and its impact on the performance of the cattle industry in Malaysia. The study aimed to identify key patterns, gaps, and future directions by analyzing scholarly publications from 2020 to 2025. The findings provide valuable insights into the current state of research, its interdisciplinary nature, and its implications for enhancing the resilience and sustainability of the cattle supply chain.

The analysis revealed a rising trend in publications, with Environmental Science, Agricultural and Engineering, and Biological Sciences emerging as the dominant subject areas. This highlights the growing emphasis on environmental sustainability, technological innovation, and agricultural productivity in addressing supply chain risks. Key research clusters focused on risk mitigation strategies, supply chain resilience, and livestock productivity, though studies specifically addressing the Malaysian context remain limited.

The most cited articles underscored the importance of sustainability, digital transformation, and risk management in agricultural supply chains, particularly in response to global disruptions like the COVID-19 pandemic. Technologies such as blockchain and artificial intelligence were frequently highlighted as tools to enhance transparency, efficiency, and resilience. Geographically, China, the United States, and India led in research output, while Malaysia's representation was notably absent among the top contributors, suggesting an opportunity for greater local academic engagement.

This study contributes to the field by mapping the current research landscape, identifying gaps, and emphasizing the need for targeted SCRM strategies in Malaysia's cattle industry. The findings have practical implications for policymakers, industry stakeholders, and researchers, advocating for integrated approaches that combine technological adoption, environmental sustainability, and risk mitigation to strengthen supply chain performance.

Limitations of this study include its reliance on a single database (Scopus) and a restricted timeframe, which may exclude relevant publications. Future research could expand the scope to include other databases, longitudinal analyses, and more localized case studies to address these gaps. Additionally, further exploration of the role of veterinary sciences and animal health in SCRM could provide deeper insights into industry-specific challenges.

International Journal of Innovation and Industrial Revolution
EISSN: 2637-0972
IJIREV
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

In conclusion, this bibliometric analysis underscores the significance of SCRM in ensuring the sustainability and resilience of Malaysia's cattle industry. By leveraging emerging technologies and fostering interdisciplinary collaboration, the industry can address existing risks and enhance its contribution to national food security. The study calls for increased research efforts tailored to the Malaysian context to bridge current gaps and inform evidence-based strategies for the future.

Acknowledgement

We would like to express our heartfelt thanks to Universiti Islam Antarabangsa Tuanku Syed Sirajuddin (UniSIRAJ) for funding this research through the Short-Term Research Grant (STG-105/2024) of RM7,000.00. This grant provided crucial support for the success of our project. We are also grateful to the many researchers, practitioners, and collaborators who generously shared their time, expertise, and insights, enabling us to enrich the quality of this study.

References

Aizat Md Sin, M., Shabudin Ariffin, A., Farzuha Nor, N., & Fairuz Ramli, M. (2024). The Contribution of Supply Chain Risk Management Towards the Performance of the Cattle Industry in the Northern Region, Malaysia. In T. null, W. null, N. Rahmawati, S. null, R. Wulandari, F. R. Fivintari, M. Senge, A. A. Aziz, M. M. Tjale, A. B. Robani, P. Saiyut, bin K. M. F, J. Sharifuddin, H. Basha, Z. Pengfei, Y. Witono, J. H. Mulyo, & B. Krisnamurthi (Eds.), *E3S Web of Conferences* (Vol. 595). EDP Sciences. https://doi.org/10.1051/e3sconf/202459501035

Bahn, R. A., Yehya, A. A. K., & Zurayk, R. (2021). Digitalization for sustainable agri-food systems: Potential, status, and risks for the Mena region. *Sustainability (Switzerland)*, *13*(6). https://doi.org/10.3390/su13063223

Cao, Y., Yi, C., Wan, G., Hu, H., Li, Q., & Wang, S. (2022). An analysis on the role of blockchain-based platforms in agricultural supply chains. *Transportation Research Part E: Logistics and Transportation Review*, *163*. https://doi.org/10.1016/j.tre.2022.102731

Cárdenas-Arias, C. G., Zuza-Hernández, E., Quiroga-Méndez, J. E., Lengerke-Perez, O., & Acosta-Cárdenas, O. A. (2023). Lactic acid production a bibliometric study. *Periodicals of Engineering and Natural Sciences*, *11*(6), 27–35. https://doi.org/10.21533/pen.v11i6.3892.g1345

Costas, R., Van Leeuwen, T. N., & Bordons, M. (2009). A bibliometric methodology for supporting research assessment at individual level: A classification approach. *12th International Conference on Scientometrics and Informetrics, ISSI 2009*, 817–828. https://www.scopus.com/inward/record.uri?eid=2-s2.0-79951947422&partnerID=40&md5=f7c3cd67e6ef3628cac79516fcb0f65a

Costas, R., Van Leeuwen, T. N., & Bordons, M. (2010). A bibliometric classificatory approach for the study and assessment of research performance at the individual level: The effects of age on productivity and impact. *Journal of the American Society for Information Science and Technology*, *61*(8), 1564–1581. https://doi.org/10.1002/asi.21348

de Janvry, A., & Sadoulet, E. (2020). Using agriculture for development: Supply- and demand-side approaches. *World Development*, *133*. https://doi.org/10.1016/j.worlddev.2020.105003

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

Foudah, A., Tarek, M., Essam, S., El Hawary, M., Adel, K., & Marzouk, M. (2024). Digital twin publications in construction (2017–2023): a bibliometrics-based visualization analysis. *Construction Innovation*. https://doi.org/10.1108/CI-09-2023-0229

Grinnell, N. A., van der Linden, A., Azhar, B., Nobilly, F., & Slingerland, M. (2022). Cattle-oil palm integration – a viable strategy to increase Malaysian beef self-sufficiency and palm oil sustainability. *Livestock Science*, *259*. https://doi.org/10.1016/j.livsci.2022.104902

Hallinger, P., & Kovačević, J. (2022). Applying bibliometric review methods in education: rationale, definitions, analytical techniques, and illustrations. In *International Encyclopedia of Education: Fourth Edition* (pp. 546–556). Elsevier. https://doi.org/10.1016/B978-0-12-818630-5.05070-3

Hasan, F., Setia Budi, H., Yuliana, L. T., & Sujarwadi, M. (2024). Trends of machine learning for dental caries research in Southeast Asia: insights from a bibliometric analysis. *F1000Research*, *13*. https://doi.org/10.12688/f1000research.154704.3

Hashom, H., Ariffin, A. S., Md Sin, M. A., & Ahmad, A. (2023). Challenges in Cattle-Beef Product Supply: KLPKas Value Creation Strategic Plan. In W. null, T. null, S. null, N. Rahmawati, Z. Rozaki, R. Wulandari, M. Senge, M. F. Kamarudin, M. M. Tjale, Y. Witono, & J. H. Mulyo (Eds.), *E3S Web of Conferences* (Vol. 444). EDP Sciences. https://doi.org/10.1051/e3sconf/202344402009

Islam, M. S., Degu, N. Y., Haron, A. W., Jesse Abdullah, F. F., Wen Han, M. H., & Fitri, W.-N. (2021). Growth and reproductive performance of the indigenous Kedah-Kelantan (KK) cattle: A review. *Pertanika Journal of Tropical Agricultural Science*, *44*(1), 25–48. https://doi.org/10.47836/PJTAS.44.1.02

Koo, M., & Lin, S.-C. (2023). An analysis of reporting practices in the top 100 cited health and medicine-related bibliometric studies from 2019 to 2021 based on a proposed guidelines. *Heliyon*, *9*(6). https://doi.org/10.1016/j.heliyon.2023.e16780

Li, J., & Wei, R. (2022). VOSviewer Application Status and Its Knowledge Base. *Journal of Library and Information Science in Agriculture*, *34*(6), 61–71. https://doi.org/10.13998/j.cnki.issn1002-1248.21-0843

Lim, W. M., Kumar, S., & Donthu, N. (2024). How to combine and clean bibliometric data and use bibliometric tools synergistically: Guidelines using metaverse research. *Journal of Business Research*, *182*. https://doi.org/10.1016/j.jbusres.2024.114760

Malmqvist, J., Machado, T., Meikleham, A., & Hugo, R. (2019). BIBLIOGRAPHIC DATA ANALYSIS OF CDIO CONFERENCE PAPERS FROM 2005-2018. In J. Bennedsen, A. B. Lauritsen, K. Edstrom, N. Kuptasthien, J. Roslof, & R. Songer (Eds.), *Proceedings of the International CDIO Conference* (pp. 816–833). Chalmers University of Technology. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85145886066&partnerID=40&md5=552d45e3b93fc1678c65b3b395d16218

Mangla, S. K., Kazançoğlu, Y., Yıldızbaşı, A., Öztürk, C., & Çalık, A. (2022). A conceptual framework for blockchain-based sustainable supply chain and evaluating implementation barriers: A case of the tea supply chain. *Business Strategy and the Environment*, *31*(8), 3693–3716. https://doi.org/10.1002/bse.3027

Mansur, A., & Maghfiroh, M. F. N. (2024). Risk Mitigation Strategies for Sustainable Poultry Supply Chain Management. *Advance Sustainable Science, Engineering and Technology*, *6*(4). https://doi.org/10.26877/asset.v6i4.997

Marvi, R., & Foroudi, M. M. (2023). Bibliometric analysis: Main procedure and guidelines. In *Researching and Analysing Business: Research Methods in Practice* (pp. 43–54). Taylor and Francis. https://doi.org/10.4324/9781003107774-4

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

Md. Said, M. F., & Man, N. (2014). Evaluation of Target Area Concentration (TAC) Programme in Malaysia's Integrated Cattle and Oil Palm Farming. *Journal of Food Products Marketing*, *20*, 151–163. https://doi.org/10.1080/10454446.2014.921870

Mezquita, B., Alfonso-Arias, C., Martínez-Jaimez, P., & Borrego, Á. (2024). The use of bibliometrics in nursing science: Topics, data sources and contributions to research and practice. *Nursing Open*, *11*(9). https://doi.org/10.1002/nop2.70036

Nayal, K., Raut, R. D., Narkhede, B. E., Priyadarshinee, P., Panchal, G. B., & Gedam, V. V. (2023). Antecedents for blockchain technology-enabled sustainable agriculture supply chain. *Annals of Operations Research*, *327*(1), 293–337. https://doi.org/10.1007/s10479-021-04423-3

Nayal, K., Raut, R., Priyadarshinee, P., Narkhede, B. E., Kazancoglu, Y., & Narwane, V. (2022). Exploring the role of artificial intelligence in managing agricultural supply chain risk to counter the impacts of the COVID-19 pandemic. *International Journal of Logistics Management*, *33*(3), 744–772. https://doi.org/10.1108/IJLM-12-2020-0493

Nchanji, E. B., Lutomia, C. K., Chirwa, R., Templer, N., Rubyogo, J. C., & Onyango, P. (2021). Immediate impacts of COVID-19 pandemic on bean value chain in selected countries in sub-Saharan Africa. *Agricultural Systems*, *188*. https://doi.org/10.1016/j.agsy.2020.103034

Öztürk, O., Kocaman, R., & Kanbach, D. K. (2024). How to design bibliometric research: an overview and a framework proposal. *Review of Managerial Science*, *18*(11), 3333–3361. https://doi.org/10.1007/s11846-024-00738-0

Pulighe, G., & Lupia, F. (2020). Food first: COVID-19 outbreak and cities lockdown a booster for a wider vision on urban agriculture. *Sustainability (Switzerland)*, *12*(12). https://doi.org/10.3390/su12125012

Radzil, R. H. M. (2024). Economic efficiency of beef cattle farms in Peninsular Malaysia. In T. F. Ying (Ed.), *IOP Conference Series: Earth and Environmental Science* (Vol. 1397, Issue 1). Institute of Physics. https://doi.org/10.1088/1755-1315/1397/1/012028

Sahu, K., & Chakma, S. (2024). Recent trends on hydrogel development and sustainable applications: a bibliometric analysis and concise review. *Polymer Bulletin*, *81*(9), 7687–7711. https://doi.org/10.1007/s00289-023-05080-1

Sharma, R., Shishodia, A., Kamble, S., Gunasekaran, A., & Belhadi, A. (2024). Agriculture supply chain risks and COVID-19: mitigation strategies and implications for the practitioners. *International Journal of Logistics Research and Applications*, *27*(11), 2351–2377. https://doi.org/10.1080/13675567.2020.1830049

Siu, W. H. S., Lim, A. Y., Liu, J.-R., Chang, S.-H., Chen, W.-M., Li, P.-R., & See, L.-C. (2025). Cancer publications using real-world data from the Taiwan National Health Insurance Research Database: Conceptual framework and bibliometric analysis. *Journal of the Chinese Medical Association*, *88*(5), 398–409. https://doi.org/10.1097/JCMA.0000000000001227

Smith, P., Calvin, K., Nkem, J., Campbell, D., Cherubini, F., Grassi, G., Korotkov, V., Le Hoang, A., Lwasa, S., McElwee, P., Nkonya, E., Saigusa, N., Soussana, J.-F., Taboada, M. A., Manning, F. C., Nampanzira, D., Arias-Navarro, C., Vizzarri, M., House, J., … Arneth, A. (2020). Which practices co-deliver food security, climate change mitigation and adaptation, and combat land degradation and desertification? *Global Change Biology*, *26*(3), 1532–1575. https://doi.org/10.1111/gcb.14878

Tomé, P. (2024). Information Systems Field: An Analysis Through a Bibliometric Methodology. In A. Iglesias, J. Shin, B. Patel, & A. Joshi (Eds.), *Lecture Notes in*

International Journal of Innovation and Industrial Revolution
IJIREV
EISSN: 2637-0972
Volume 7 Issue 22 (September 2025) PP. 320-338
DOI 10.35631/IJIREV.722021

Networks and Systems (Vol. 834, pp. 1–8). Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/978-981-99-8349-0_1

Van Eck, N. J., & Waltman, L. (2009). VOSviewer: A computer program for bibliometric mapping. *12th International Conference on Scientometrics and Informetrics, ISSI 2009*, 886–897. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84901992309&partnerID=40&md5=2b19eafa3759e96b197c3ec7535a731f

van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, *84*(2), 523–538. https://doi.org/10.1007/s11192-009-0146-3

Wieland, A., & Marcus Wallenburg, C. (2012). Dealing with supply chain risks: Linking risk management practices and strategies to performance. *International Journal of Physical Distribution & Logistics Management*, *42*(10), 887–905. https://doi.org/10.1108/09600031211281411

Xu, M., Yang, X., & Sun, Z. (2025). Risk Identification and Prevention of Supply Chain Operation in Small and Medium-Sized Livestock Farms. *Systems*, *13*(5). https://doi.org/10.3390/systems13050308

Zhang, Y., Wang, X., Zhang, G., & Lu, J. (2018). Predicting the dynamics of scientific activities: A diffusion-based network analytic methodology. *Proceedings of the Association for Information Science and Technology*, *55*(1), 598–607. https://doi.org/10.1002/pra2.2018.14505501065