

# **A Review of Food Supply Chain Management (FSCM) Based on Bibliometric Analysis**

**Patnia Nur Saputri**

Graduate of Industrial Engineering  
Department of Industrial Engineering, Faculty of Engineering  
Universitas Sebelas Maret  
Surakarta, Indonesia  
[patnianursaputri@student.uns.ac.id](mailto:patnianursaputri@student.uns.ac.id)

**Muhammad Hisjam**

Research Group Industrial Engineering and Techno-Economic  
Department of Industrial Engineering, Faculty of Engineering  
Universitas Sebelas Maret  
Surakarta, Indonesia  
[hisjam@staff.uns.ac.id](mailto:hisjam@staff.uns.ac.id)

**Gusti Fauza**

Department of Food Science and Technology, Faculty of Agriculture  
Universitas Sebelas Maret  
Surakarta, Indonesia  
[gustifauza@staff.uns.ac.id](mailto:gustifauza@staff.uns.ac.id)

## **Abstrack**

Recently, research in food supply chain management (FSCM) continues to grow, especially in the era of the COVID-19 pandemic, which can change the direction of research. This study presents a bibliometric analysis to develop trends in the FSCM study. Descriptive statistical analysis of the literature review study method using VOSviewer software aims to identify and classify the framework of thinking that explains the problem-solving used in FSCM researchers so that the proposed future research direction can be known. Quantitative data comes from articles indexed by Scopus. The total number of pieces is 241 showing that the University of Wageningen tops the list with seven by publication. Based on the most prolific author, out of a total of 64 authors with at least two documents, the author Iakovou e. topped the rankings with five articles, 208 citations, and a total link strength of 9. By country, China tops the list with 34 publications with 533 medals. In conclusion, the development of the number of publications on Scopus based on the article titled "food supply chain management" during 1997-2021 shows that the number of studies has increased significantly.

## **Keyword**

Food supply chain management, Agri-food supply chain, Sustainable supply chain, Bibliometric analysis and VOSviewer.

## **1. Introduction**

The COVID-19 pandemic first occurred in 2019 and spread throughout 2020, devastatingly impacting almost all sectors, especially the food crisis that occurred in several parts of the country. This was caused by several factors, including high consumer demand, changing consumer buying patterns, and panic buying. From the supply chain side, there were disruptions, such as labor shortages and transportation delays. One of the sciences that examines the food supply chain is Food Supply Chain Management (Hobbs 2020). FSCM has been created to describe the activities or operations of production, distribution, and consumption to maintain the safety and quality of various foods efficiently and effectively (Zhong et al. 2017). The FSCM framework is the basis for making, processing, and transforming raw materials and semi-finished products from primary activities such as forestry, agriculture, and so on (Dubey et al. 2017). The difference

between FSCM from other supply chains, such as furniture logistics and supply chain management, is significant and reflected in factors such as food quality, safety and freshness in a limited time, which makes the supply chain more complex and challenging to manage (La Scalia et al. 2016). As a cutting-edge technological development, FSCM has been widely recognized by practitioners and academics. Information technology (IT) has brought FSCM improvements in automated food processing, such as cleaning, packaging, and freshness storage (Wang et al. 2015). Currently, Food Supply Chain Management (FSCM) is closely related to the science of Sustainable Supply Chain Management (SSCM), which aims to generate added value from three aspects of sustainability, including economic, environmental and social (Hisjam 2018).

The discipline of FSCM is still unable to satisfactorily address many real-life challenges (Koehorst 1997). One way to respond to current challenges is to know the development trends of research on FSCM in a certain period. Therefore, this study aims to identify trends and characteristics of food supply chain management research using a Systematic Literature Network Analysis (SLNA) or bibliometric approach in research from various Scopus-indexed countries.

### **1.1 Objectives**

This article was compiled to identify trends and characteristics of the development of the food supply chain management science using a bibliometric approach in research from various countries. This article presents descriptive statistical data that has been processed and analyzed based on several criteria, namely the highest number of studies from the affiliation point of view, the most productive authors, the number of publications from various countries, and the keywords that are often used. The discussion also explained how the development of FSCM research based on the subject area after the COVID-19 pandemic occurred.

## **2. Literature Review**

Food supply chain management and agri-food supply chain management involve a series of activities transforming food and agricultural products from raw to consumption. This activity includes the procurement of raw materials, production processes, marketing processes, product storage, and sales. Important entities participating in this process are consumers, raw material suppliers (farmers), processors, and human resources engaged in distribution services and storage activities, etc. (Ganeshkumar et al. 2017).

Previous research on FSCM that was conducted, including in the economic field (Sharaf-addin 2021), examined Target Costing (TC) through the role of supply chain management in food and beverage companies in Saudi Arabia. The number of companies selected to fill out the questionnaire was 248. Then 186 response companies were accepted as research material reviewed. The method combines the Rasch Measurement Model (RMM) and Structural Equation Modeling (SEM). The study results show that in the relationship between price-based TC processes with financial and non-financial implicits, buyer participation significantly influences the mediating role of supply chain management.

Research in the social science field was conducted by (Kramer et al. 2021) to investigate the effect of coordination mechanisms on agri-food supply chains by implementing Blockchain Technology Platform Types (BCTPT). The results show that the BCTPT predominantly differentiates through the coordination mechanisms exerting power, information sharing, decision-making, and collective learning benefits. Thus, it is concluded that the BCPTT, with its respective coordination mechanism, is the primary determinant of economic success, efficient management of SCM, and the digital business model to be selected.

FSCM research in the field of environmental science entitled "Sustainability Assessment with Structural Equation Modeling in Fresh Food Supply Chain Management," written by (Yontar and Ersöz 2021), has the objective of knowing the dimensions that affect sustainability performance in the supply chain of fresh vegetables and fruits. In addition, it determines the performance that occurs along the chain line. The dimensions used are supply chain management, resource management, food safety, packaging, and waste management. The method combines the Structural Equation Model (SEM) with the Analytical Hierarchy Process (AHP). The results showed that the dimension with the highest performance was supply chain management, with a score of 91.22%. Then, the lowest performance dimension is at a score of 66.77%, namely in waste management.

## **3. Methods**

This research uses a descriptive statistical analysis approach with a literature review study method based on bibliometric analysis with the VOSviewer software tool. Bibliometrics is a systematic way to analyze scientific journals and other

written and unwritten (digital) publications and studies that measure the development of research, literature, books or documents in specific fields both quantitatively and qualitatively using statistical methods ( Royani and Idhani 2018). Bibliometric analysis is a study of bibliographic analysis of scientific activities, which is based on the assumption that a researcher carries out his research and must communicate the results to colleagues. This will provide progress and development of knowledge if researchers carry out joint activities to study specific research topics. In the classical input-output model to explain the process of scientific research, publications are recommended to present knowledge output. Almost all publications in articles and scientific monograph works are definitive statements of research results (Tupan et al. 2018). Bibliometrics is divided into two major groups: descriptive bibliometrics and behavioural bibliometrics. Descriptive bibliometrics describes the characteristics of a piece of literature, while behavioural bibliometrics examines the relationships formed between the components of the literature (Hakim 2020).

#### **4. Data Collection**

This study used research data from the official Scopus website ([www.scopus.com](http://www.scopus.com)), accessed on August 10, 2022. Scopus was chosen as the data source because scientific articles indexed by Scopus went through a peer review process (Hakim 2020). According to Saleh and Sumarni, Scopus is the world's largest data centre, including tens of millions of scientific literature published decades ago and owned by Elsevier (Saleh and Summary 2016). Scopus collects abstracts from various scientific literature, including journals, books and proceedings. Scopus creates a scientific literature index to provide accurate information regarding the metadata of each scientific article, including publication date, abstracts and other references (Sawitri 2019). Scopus helps researchers to search, analyze, and visualize research more effectively (Haryani and Sudin 2020).

##### **4.1 Data Collection**

Step 1: The initial data collection process was done through the official Scopus website by writing keywords (Supply chain management AND Agri-food OR Food OR Agrifood) and selecting a search based on "article title". The initial data search results yielded 257 documents. The data obtained at the beginning needs to be filtered against several categories so that the articles match the expected criteria. The data sets installed: TITLE (Supply Chain Management AND Agri-food OR Food OR Agrifood) AND LIMIT-TO (DOCTYPE, "Article") OR LIMIT-TO (DOCTYPE, "Conference Paper") OR LIMIT-TO (DOCTYPE, "Book Chapter") OR LIMIT-TO (DOCTYPE, "Review") OR LIMIT-TO (DOCTYPE, "Book") AND LIMIT-TO (LANGUAGE, "English"). The search results obtained several 241 article data.

Step 2: Documents that have been filtered with a total of 241 data, then exported as an Excel CSV file. The breakdown of document types from the 241 data consisted of articles (n=132), conference papers (n=60), book chapters (n=33), reviews (n=11), and books (n=5). Exported data contains various information, including citations, bibliographic information, abstracts and keywords, and other information.

##### **4.2 Data Analysis**

This study used quantitative and qualitative descriptive analysis methods based on a bibliometric approach. Bibliometric analysis using VOSviewer software to display bibliometrics graphically. VOSviewer (visualization of similarities-viewer) is software for creating maps based on network data and visualizing and exploring those maps. VOSviewer has several primary functions: creating maps based on network data. VOSviewer can build a network of scientific publications, journals, researchers, research organizations, countries, keywords, or terms. Second, visualizing and exploring maps. VOSviewer provides three map visualizations: network visualization, overlay visualization, and density visualization (Tupan et al., 2018). VOSviewer software can be downloaded and installed free via the official web ([www.vosviewer.com](http://www.vosviewer.com)).

Step 1: First, Scopus data processing on the "Analyze" menu. This menu helps researchers with outputs from statistical results and graphical representations. Another output from Scopus is secondary data in Excel RIS and CSV formats.

Step 2: Second, data processing with VOSviewer software. The output of data processing with VOSviewer is a network map based on keywords, based on authors, bibliographic coupling networks, and based on country.

Step 3: Third, analyzing the output data of Scopus and VOSviewer in a qualitative descriptive manner.

## 5. Results and Discussion

### 5.1 Food Supply Chain Management Publication Trends

Based on the results of searching the data for analysis, 257 initial data were obtained from Scopus, then filtered based on the type of document and language so that a total of 241 data was obtained, shown in Figure 1. The first research on food supply chain management was conducted (Chiappe and Herrero 1997) in "the international journal of logistics management". The study surveyed the development of supply chain management and data collected from suppliers and buyers at three levels of the supply chain.

In 1998, research on agri-food supply chain management experienced the addition of 3 studies in the following year. First, (Westgren 1998) in the "Canadian Journal of Agricultural Economics" discusses innovation and future directions of SCM in US Agri-Food. Both published in the same journal (Hobbs 1998) examine the innovations and future directions of supply chain management in the Canadian agri-food industry. The third study (Van et al. 1998) published in "International Transactions in Operational Research" discusses supply chain management in the food chain: improving performance by reducing uncertainty.

FSCM publications in the 2000-2010 period have remained relatively high. For example, in 2004, there was a vacancy in FSCM publications. Some of the publications in that period include (Lindgreen and Hingley 2003), published in the "British Food Journal" examining the impact of food safety and animal welfare policies on supply chain management: The case of the Tesco meat supply chain. Research in business, management, and accounting conducted by (Wang et al. 2009) examines adding value to food traceability to business: the supply chain management approach. Meanwhile, research in the field of engineering was carried out by (Bayraktar et al. 2010) in the "International Journal of Production Research" discussing the comparison of the efficiency of supply chain management and information system practices: A study of small and medium enterprises in Turkey and Bulgaria in food products and drinks.

Research from 2011 to 2021 shows an increasing graph, as shown in Figure 1. The most research in 2021 was 40 publications from various fields. Research in business, management, and accounting (Sharaf-addin 2021), (Hong et al. 2020). The development of research on FSCM in various countries has experienced an up-and-down trend but based on the overall graph, and the research trend has increased over the last 25 years.

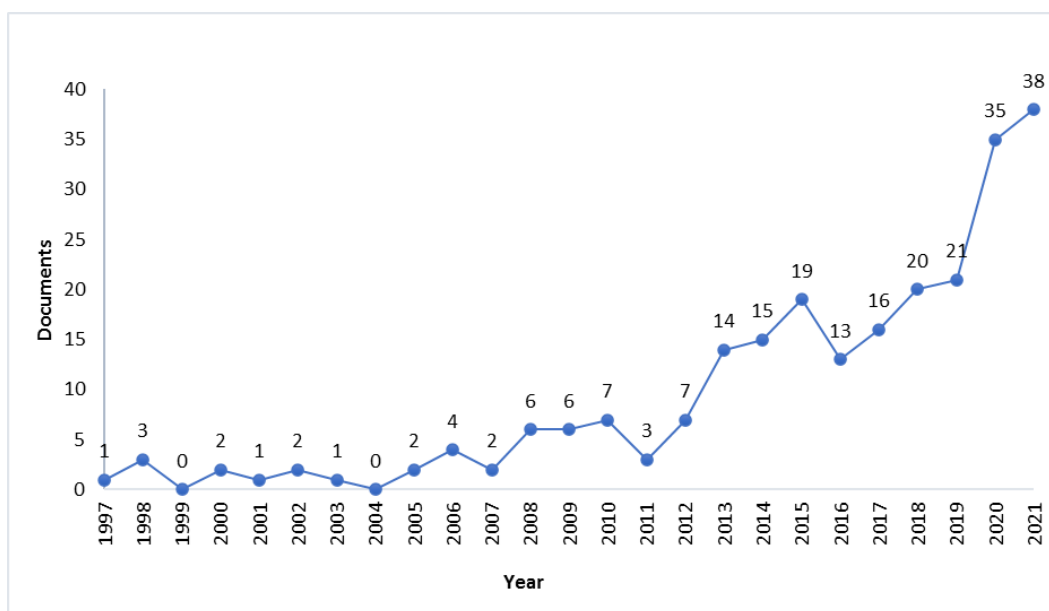


Figure 1. Graph of Total FSCM Research Data After Screening Indexed Scopus 1997-2021

### 5.2 Number of FSCM Research Publications Based on Affiliation

The development of publications based on affiliation is shown in Table 1. Wageningen University and Research generated most positions. Besides that, Aristotle University of Thessaloniki also has the same number, each producing a total of seven publications.

Table 1. FSCM Research Publications Based on Affiliation

Affiliation	Number of Documents
Wageningen University & Research	7
Aristotle University of Thessaloniki	7
Universitat Kassel	4
Consiglio Nazionale delle Ricerche	4
Alma Mater Studiorum Universita	4
Cranfield University	3
Universitat Bonn	3
Technological Education Institute of Central Macedonia	3
University of Liverpool	3
University of Plymouth	3

### 5.3 Number of FSCM Publications Based on Most Prolific Authors

Based on the number of publications of 241 articles on food supply chain management at Scopus from 1997 to 2021 with a total of 662 authors. This analysis uses VOSviewer software with the following settings.

- Type of analysis = Co-authorship
- Unit of analysis = Authors
- Minimal number of documents of an author = 2

Table 2. Most Prolific Author of FSCM Publications

Author	Documents	Citations	Total link strength
Iakovou E.	5	208	9
Vlachos D.	5	208	9
Seuring S.	4	734	4
Mangla S.K.	3	83	5
Wang X.	3	68	4
Paloviita A.	3	12	2
Wang J.	3	55	2
Fearne A.	3	208	1
Dellino G.	2	36	8
Laudadio T.	2	36	8
Mari R.	2	36	8
Mastronardi N.	2	36	8
Meloni C.	2	36	8
Aidonis D.	2	23	6
Bochtis D.	2	23	6
Assefa T.	2	23	4
Giagnocavo C.	2	30	4
La Scalia G.	2	63	4
Meuwissen M.P	2	23	4
Micale R.	2	63	4

Based on the data settings, a total of 64 authors who have at least two documents are obtained. Table 2. shows that the author with the most documents is Iakovou e. a total of 5 documents, cited as many as 208. The number of documents

produced by the author differs from the result, which will be directly proportional to the number of citations. For example, a writer named Seuring s. has produced four documents with a total of more citations, namely 734 times.

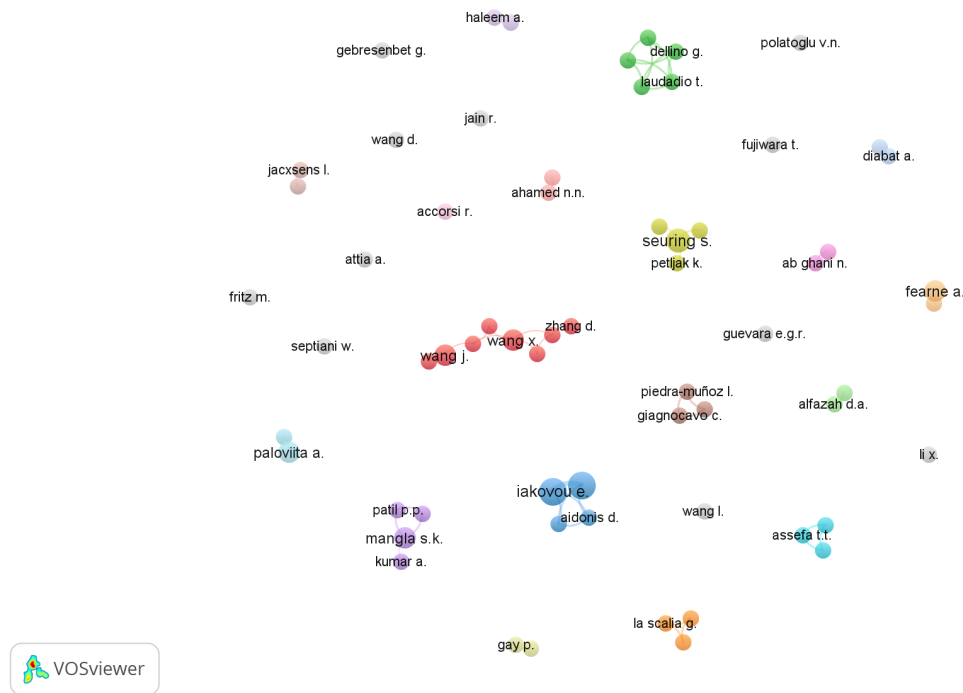


Figure 2. Network Visualization Between Authors

In the output analysis results in Figure 2. using the VOSviewer software, it is known that 64 authors are divided into 29 clusters based on the relationship between co-authors. Cluster 1 shows the most correlation with several eight authors, including Huang j., Li d., Li. l., Shen x., Wang j., Wang x., Yang j., and Zhang d. Then, cluster 2 shows the relationship of writing between 5 authors.

#### **5.4 Number of FSCM Publications by Country**

The analysis results using VOSviewer software show that the highest number of publications with the theme of food supply chain management was produced by China, with 34 documents and 533 citations. The second position was followed by the United Kingdom (UK), with 29 documents and 919 citations. The third place is India, with a total of 28 documents with 562 citations. The highest total network strength in the United Kingdom is 19, meaning that the UK has a network or scattered relationships with interrelated researchers from other countries.

The results of an overlay visualization network between countries are obtained in Figure 3. It shows 30 countries, each with a minimum of 2 research documents. The 30 countries are divided into 8 clusters based on the number of relations between countries.



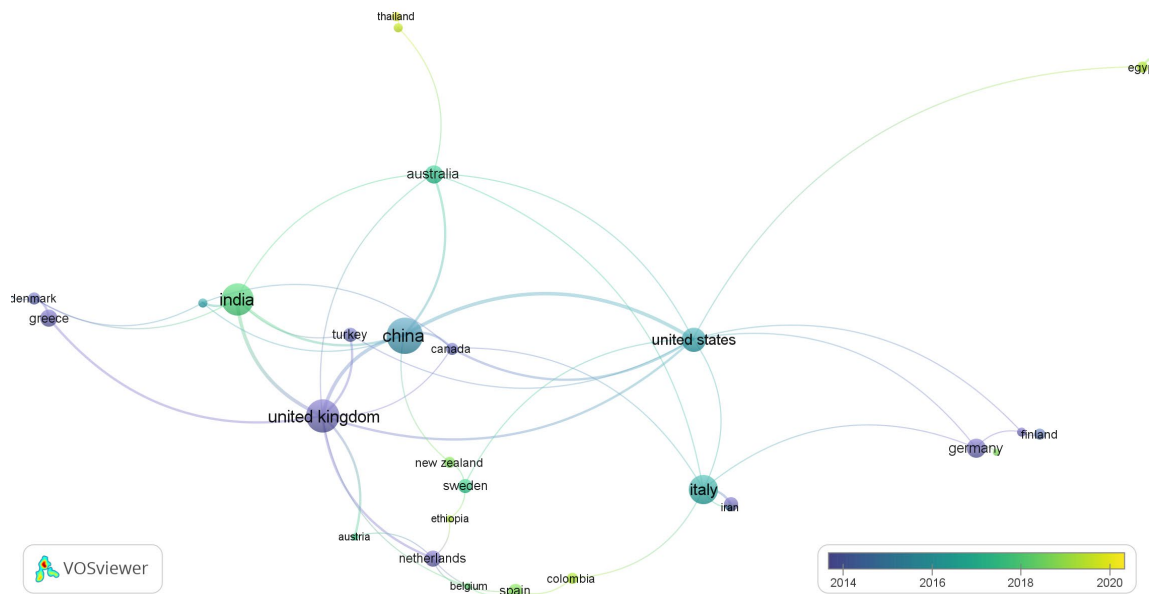


Figure 3. Overlay Visualization of Networks Between Countries

### 5.5 Keyword Based Network

The optical network is based on keywords from the author with a minimum input setting of 2 documents. The results in Figure 4. show that the number of items is 95, the number of clusters is 14, and the total network strength is 430. Keywords that often appear are "supply chain management", "food supply chain", "sustainable supply chain management", "green supply chain management", and "agri-food supply chain".

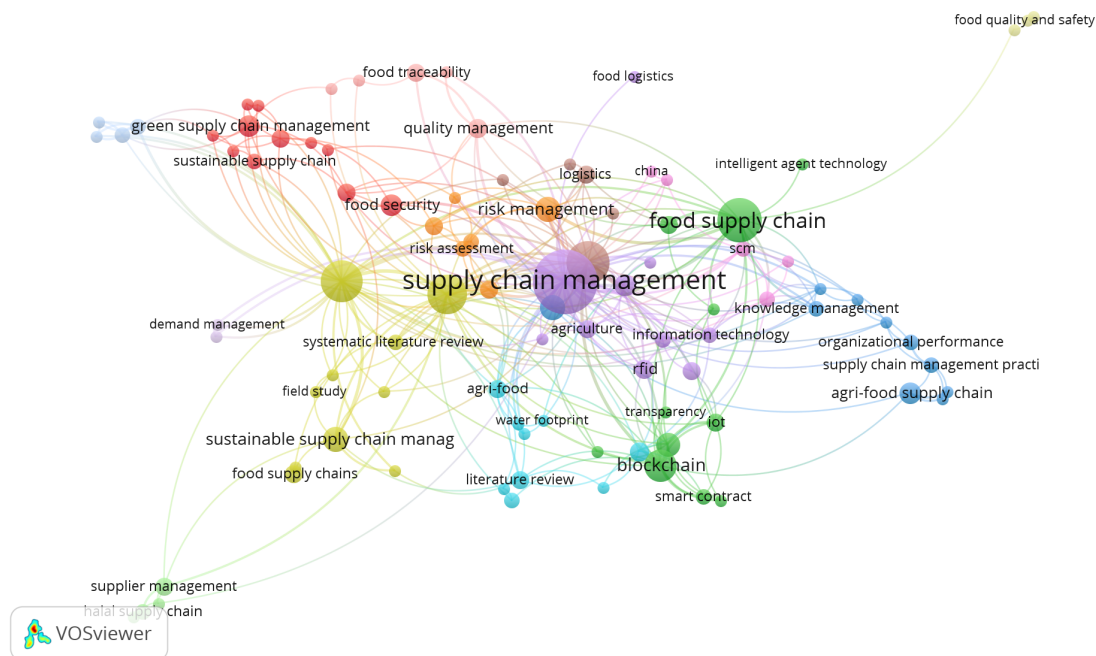


Figure 4. Keyword Based Network Visualization

## 5.6 Discussion

Based on the results of an analysis using data from a total of 241 publications sourced from Scopus and processed using VOSviewer software, the result is that this bibliometric research can be used as a benchmark for determining novelty for research that has never been carried out on the theme "food supply chain management." The number of publications is based on affiliation, and Wageningen University and Research's highest position was generated, with seven publications. Based on a total of 64 authors with at least two documents, it is known that the author with the most documents is Iakovou e. with a total of 5 documents and 208 citations. The results of the statistical analysis obtained show that the development of the number of FSCM publications on Scopus based on the article titled "food supply chain management" has proven to have increased from the first year, namely 1997 to 2021.

Research developments can also be seen based on the subject area to determine the study's scope. Table 3. shows the development of FSCM research based on the subject area for the last five years. Based on the shift in the research study area, it can be seen that research has increased in 2020-2021, after the COVID-19 pandemic, especially in the "Business, Management, and Accounting" area. This shows that more research is being carried out due to the COVID-19 pandemic, which has affected all sectors, including the economy. Many business people have experienced declines and losses, so FSCM's research helps improve work systems for economic recovery, which is a problem in many countries. In addition, FSCM has also experienced increased research in the subject area "Engineering" and "Computer Science."

Table 3. FSCM Research Based on Subject Areas for 2017-2021

Years	Ranking	Subject Area	Documents
2021	1	Business, Management, and Accounting	16
	2	Engineering	15
	3	Computer Science	13
2020	1	Business, Management, and Accounting	20
	2	Computer Science	17
	3	Engineering	14
2019	1	Computer Science	13
	2	Business, Management, and Accounting	8
	3	Decision Science	7
2018	1	Business, Management, and Accounting	13
	2	Engineering	8
	3	Decision Science	7
2017	1	Business, Management, and Accounting	8
	2	Engineering	8
	3	Computer Science	6

## 6. Conclusion

Food Supply Chain Management (FSCM) research continues to increase over time. After the COVID-19 pandemic, numbers were shifted based on the research subject area, which shows that a phenomenon that occurs can affect the research direction. The current FSCM field of study and future research can be connected with sustainability science to pay more attention to economic, social and environmental aspects.

## References

- Bayraktar, E., Gunasekaran, A., Koh, S. C. L., Tatoglu, E., Demirbag, M., & Zaim, S., An efficiency comparison of supply chain management and information systems practices: A study of Turkish and Bulgarian small- and medium-sized enterprises in food products and beverages, *International Journal of Production Research*, vol. 48, no. 2, pp. 425–451, 2010.
- Chiappe, I. S., & Herrero, V. A., The Status of Supply Chain Management in Argentina's Food Industry, *The*



- International Journal of Logistics Management*, vol. 8, pp. 87–96, 1997.
- Dubey, R., Gunasekaran, A., Papadopoulos, T., Childe, S. J., Shibin, K. T., & Wamba, S. F., Sustainable supply chain management: framework and further research directions, *Journal of Cleaner Production*, vol. 142, pp. 1119–1130, 2017.
- Ganeshkumar, C., Pachayappan, M., & Madanmohan, G., Agri-food Supply Chain Management: Literature Review, *Intelligent Information Management*, vol. 09, no. 02, pp. 68–96, 2017.
- Hakim, L., Analisis Bibliometrik Penelitian Inkubator Bisnis Pada Publikasi Ilmiah Terindeks Scopus, *Procuratio: Jurnal Ilmiah Manajemen*, vol. 8, no. 2, pp. 176–189, 2020.
- Haryani, C. S., & Sudin, A., Analisis Bibliometrik Tren Publikasi dan Tingkat Kolaborasi pada Model Situation-Based Learning (2010-2019), *Jurnal Pena Ilmiah*, vol. 3, no. 2, pp. 131–140, 2020.
- Hisjam, M., Perkembangan Riset Bidang Manajemen Rantai Pasok Berkelanjutan, *PERFORMA Media Ilmiah Teknik Industri*, vol. 17, no. 2, pp. 103–110, 2018.
- Hobbs, J. E., Innovation and future direction of supply chain management in the Canadian agri-food industry, *Canadian Journal of Agricultural Economics*, vol. 46, no. 4, pp. 525–537, 1998.
- Hobbs, J. E., Food supply chains during the COVID-19 pandemic, *Canadian Journal of Agricultural Economics*, vol. 68, no. 2, pp. 171–176, 2020.
- Hong, J., Zhou, Z., & Li, X., Supply chain quality management SCQM and firm performance in China' s food industry food industry — the moderating role of social co-regulation. vol. 31, no. 1, pp. 99–122, 2020.
- Koehorst, H., *Insights from industry Challenges in international food supply chains: vertical co-ordination in the European agribusiness Henk Folkerts and*, vol. 2, no. 1, pp. 11–14, 1997.
- Kramer, M. P., Bitsch, L., & Hanf, J., Blockchain and its impacts on agri-food supply chain network management, *Sustainability (Switzerland)*, vol. 13, no. 4, pp. 1–22, 2021.
- La Scalia, G., Settanni, L., Micale, R., & Enea, M., Predictive shelf life model based on RF technology for improving the management of food supply chain: A case study, *International Journal of RF Technologies: Research and Applications*, vol. 7, no. 1, pp. 31–42, 2016.
- Lindgreen, A., & Hingley, M., The impact of food safety and animal welfare policies on supply chain management: The case of the Tesco meat supply chain, *British Food Journal*, vol. 105, no. 6, pp. 328–349, 2003.
- Royani, Y., & Idhani, D., Analisis Bibliometrik Jurnal Marine Research in Indonesia, *Media Pustakawan*, vol. 25, no. 4, pp. 63–68, 2018.
- Saleh, A. R., & Sumarni, E., Studi Bibliometrik pada Jurnal Standardisasi Pasca Terakreditasi (2011 – 2015), *Visi Pustaka*, vol. 18, pp. 231–240, 2016.
- Sawitri, D., Revolusi Industri 4.0 : Big Data Menjawab Tantangan Revolusi Industri 4.0, *Jurnal Ilmiah Maksitek*, vol. 4, no.3, pp. 1–9, 2019.
- Sharaf-addin, H., Implementation of Target costing in t he Saudi Arabian Food and Beverages Industry : The Mediating Role of Supply Chain Management, *Management and Accounting Review*, vol. 20, no. 2, 2021.
- Tupan, T., Rahayu, R. N., Rachmawati, R., & Rahayu, E. S. R., Analisis Bibliometrik Perkembangan Penelitian Bidang Ilmu Instrumentasi, *Baca: Jurnal Dokumentasi Dan Informasi*, vol. 39, no. 2, pp. 135, 2018.
- Van der Vorst, J. G. A. J., Beulens, A. J. M., De Wit, W., & Van Beek, P., Supply chain management in food chains: Improving performance by reducing uncertainty, *International Transactions in Operational Research*, vol. 5, no. 6, pp. 487–499, 1998.
- Wang, X., Chan, H. K., & Li, D., A case study of an integrated fuzzy methodology for green product development, *European Journal of Operational Research*, vol. 241, no.1, 2015.
- Wang, X., Li, D., & Li, L., Adding value of food traceability to the business: A supply chain management approach, *International Journal of Services Operations and Informatics*, vol. 4, no.3, pp.232–257, 2009.
- Westgren, R. E., Innovation and future directions of supply chain management in US agri-food, *Canadian Journal of Agricultural Economics*, vol. 46, no.4, pp.519–524, 1998.
- Yontar, E., & Ersöz, S., Sustainability assessment with structural equation modeling in fresh food supply chain management, *Environmental Science and Pollution Research*, vol. 28, no. 29, pp. 39558–39575, 2021.
- Zhong, R., Xu, X., & Wang, L., Food supply chain management: systems, implementations, and future research, *Industrial Management and Data Systems*, vol. 117, no. 9, pp. 2085–2114, 2017.

## Biographies

**Patnia Nur Saputri** is a master's student in the Department of Industrial Engineering, Faculty of Engineering, Universitas Sebelas Maret, Surakarta, Indonesia.

**Muhammad Hisjam** is a lecturer at the Department of Industrial Engineering, Faculty of Engineering, Universitas Sebelas Maret since 1998. He earned Bachelor in Agroindustrial Technology from Universitas Gadjah Mada, Master in Industrial Engineering & Management from Institut Teknologi Bandung and Ph.D in Environmental Science from Universitas Gadjah Mada. His research interests are supply chain, logistics, business and sustainable development. He published some papers in journals and proceeding his research area. He holds Accredited Supply Chain Analyst from American Academy of Project Management. He is the Head of Logistics System and Business Laboratory, Faculty of Engineering, Universitas Sebelas Maret. He is a member of IISE, AAPM and IEOM.

**Gusti Fauza** received the Bachelor degree from Andalas University and Master degree from Institute Technology of Bandung Indonesia. She completed her Ph.D. in School of Engineering, University of South Australia. Currently she is a lecturer in food science and technology in Universitas Sebelas Maret located in Surakarta, Indonesia. Research in quality management, supply chain management specifically inventory models that including food quality, are her main interest. Now, she is working in several quality management projects including supply chain management addressing food quality issues.