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BIBLIOMETRICS ON THE DIGITALIZATION OF THE AGRIBUSINESS SUPPLY CHAIN

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Abstract

The agricultural sector is one of the economic resources of a country. The adoption of technology has changed the condition of agriculture, especially in the supply chain of agricultural products to increase productivity and sustainable development. The purpose of this study is to map scientifically the adoption of digital technology in agribusiness supply chain management and provide a comprehensive picture of the relationship between digitalization and agribusiness supply chains. In this study, 181 articles were used from the Google Scholar database from 2015 to 2022 and bibliometric analysis was used to synthesize and document the literature. Using bibliometric analysis, the impact of the literature was analysed using the highest-cited articles, the most prolific journals, articles citing digitalization, supply chain, and agricultural literature, total citations and publication trends, and keyword analysis by occurrence. This review resulted that the literature trend in digitizing agricultural supply chains has grown rapidly from 2019 to 2022. This happened because, in 2019, the industrial revolution 4.0 was made into a vision by the Indonesian Ministry of Agriculture. Thus, it was adopted into the vision of Agriculture 4.0. The findings of the network view map revealed that agribusiness, supply chain, and digitalization studies have been categorized into five clusters, and the keywords indicate that the topic is more recent and hotter for research are digital platform keys, digital supply chains, blockchain, need, resilience, demand, and digitalization have not been carried out much.

Keywords: Agribusiness, Bibliometrics, Digitalization, Supply chain.

1. Introduction

The agricultural sector is one of the main sources of a country's economy [1]. The growing population growth encourages an increase in food needs [2, 3], therefore the concept of digitization is increasingly being applied to the agricultural sector as a form of industry integration 4.0 [4]. *Computer science* and *precision agriculture* are examples of digitization in the supply chain of agricultural products. Digital supply chain management has begun to be developed in Indonesia and has been implemented in many agricultural industries [5].

A digital agribusiness supply chain is a set of processes that use advanced technologies and better insights into the functions of each stakeholder along the chain to let each participant make better decisions about the sources of materials they need, the demand for their products, and all of the relationships in between. Thus, supply chains enforce internal mechanisms and develop chains. wide incentives for assuring the timely performance of production and delivery [6]. The digital supply chain used includes the *Internet of Things*, *artificial intelligence*, *big data*, and *blockchain* [3].

The agribusiness sector will progress when the supply chain conditions for its products are integrated using the concept of digitization to form an efficient agribusiness supply chain condition. Digital supply chain management does not only involve production, harvest, storage, and distribution decisions (see http://www.ryanbedwards.com/research) but also includes the provision of consumption information, reduction of food waste, sustainability, and economic cycles [7].

The use of technology to develop supply chains in a way that integrates organizations, farmers, customers, and all relevant stakeholders for economic, social, and environmental sustainability. Therefore, digitizing the agribusiness supply chain is important to mitigate several global concerns regarding productivity, profitability, cost reduction, and efficiency [8], including mitigating the impact of climate change and allocating agricultural resources reasonably and ethically [9]. Therefore, the digitization of the agribusiness supply chain is important to be analysed to develop thinking for digital agriculture [10]. This study belongs to the concept of agriculture 4.0 which discusses the development of decision support systems to integrate all members of the production chain [11], digital innovation [3, 10], and real-time integration of IoT for agriculture [12].

Several previous studies have contributed to improving the supply chain of agricultural products by adopting digital technology, one of which is the use of robots that can be used in monitoring product quality [13]. In addition, a previous study conducted a bibliometric analysis of the use of drones in agriculture. Thus, the purpose of this research is to map the scientific literature related to digitalization in agribusiness supply chain management [14]. Increasing productivity and building sustainability is the goal of adopting digital technology in agribusiness supply chains [15, 16]. In addition, previously published research explored the application of Machine Learning (ML) techniques in smart farming [5, 17]. This research is also expected to provide a comprehensive picture of digitalization relationships in the agribusiness supply chain.

2. Materials and Methods

The method used in this study is through three steps, namely data collection, *screening* data, and data analysis and visualization. The Google Scholar database from 2015 to 2022 is used in this bibliometric analysis to synthesize and map the literature. The impact of mapping the literature network can be seen in articles with the highest citations, the most productive journals, articles citing digitalization, supply chain and articles on agriculture, total citations and publication trends, as well as keyword analysis based on events.

3. Results and Discussions

3.1. Most citation article search results

Table 1 shows the most relevant and developing research data based on the highest number of citations for 22 years, from 2000 to 2022. Data in Table 1 shows 24 related publication articles on *digital agribusiness supply chain* the most cited from 2000 to 2022. The large number of citations shows that the article has many uses. The number of citations of all articles used in this study was 4516, and the average number of citations per year was 188.16.

Table 1. Article publication data on agribusiness supply chain digitization.

No.	Cites	Authors	Title	Year	GS Rank
1	964	D Ivanov, A Dolgui, B Sokolov	The impact of digital technology and Industry 4.0 on the ripple effect and supply chain risk analytics	2019	5
2	811	IN Scherer	Regulating artificial intelligence systems: Risks, challenges, competencies, and strategies	2015	195
3	522	D Ivanov, A Dolgui	A digital supply chain twin for managing the disruption risks and resilience in the era of Industry 4.0	2021	120
4	382	A Taeihagh, HSM Lim	Governing autonomous vehicles: emerging responses for safety, liability, privacy, cybersecurity, and industry risks	2019	1
5	185	B badger, S Kinkel, A hunter	Bringing it all back home? Backshoring of manufacturing activities and the adoption of Industry 4.0 technologies	2019	166
6	172	DA Zetzsche, RP Buckley, DW Arner	The distributed liability of distributed ledgers: Legal risks of blockchain	2018	158
7	130	D Ivanov, A Dolgui, A Das, B Sokolov	Digital supply chain twins: Managing the ripple effect, resilience, and disruption risks by data-driven optimization, simulation, and visibility	2019	64
8	118	J Lane	The digital street	2018	4

3.2. Research development in the field of agribusiness supply chain digitization

The trend of the article in Fig. 1 shows that from 2019 until 2022 there has been an increase and rapid development of writing regarding the digitization of agricultural supply chains. This happened because, in 2019, the industrial revolution 4.0 was made into a vision by the Indonesian Ministry of Agriculture. Thus, it was adopted into the vision of Agriculture 4.0. This publication's data also proves that there is a relationship between supply chain management and agricultural digitization.

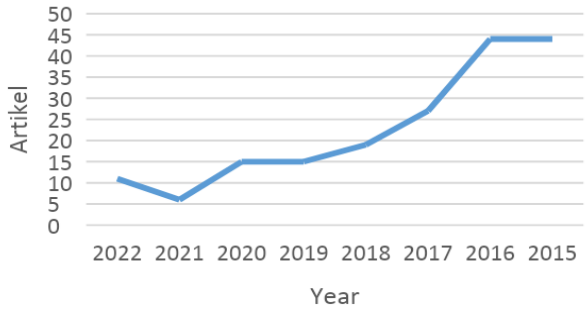

Fig. 1. The trend of the article from 2015- 2022.

The increase in the number of publications in recent years is ensured by the progress and maturity the field is achieving and reaching and by the number of researchers who have made efforts to understand the impact of technology adoption in the agribusiness supply chain [8]. Different aspects of a field of study can be understood and quantified through bibliometric analysis [18].

Figure 2 shows the network visualization based on mapping on keywords *digital supply chain agribusiness*. VOS viewer is used in mapping analysis based on the number of events/*occurrences*, i.e. the keyword is mentioned 8 times and the number of thresholds is 51. Cluster 1 is shown in red, with a total of 10 items. The keywords obtained in Cluster 1 are digital platform, evidence, farm, future, innovation, country, value, business, effects, and digital.

Cluster 2 is shown in green and has 10 items, namely agribusiness supply chain, risk, need, resilience, context, efficiency, digital tools, digital economy, digitalization, and addition. Cluster 3 is shown in blue and has 9 items, namely big data, India, agrifood supply chain, digital revolution, farmer, adoption, factor, digital agriculture, and integration. Cluster 4 is shown in yellow and has 8 items, namely the internet, things, IOT, Indonesia, operations, food safety, consumers, and logistics. Furthermore, Cluster 5 has 7 items shown in purple, namely blockchain, demand, transparency, traceability, agricultural supply chain, digital supply chain, and agricultural supply chain.

Figure 3 shows a visualization overlay showing research trends from 2000 to 2022. Dark colours indicate that these keywords have been extensively researched. The most-viewed keywords were in 2017. Yellow (brighter) keywords indicate that the topic is more recent and hotter for research. This means that articles with digital platform keys, digital supply chains, blockchain, need, resilience, demand, and digitalization have not been carried out much. Research on the following topics will

only be carried out in 2021, even though the data included in this bibliometric research uses article data until 2022. This shows that in 2022, this research has never been done.

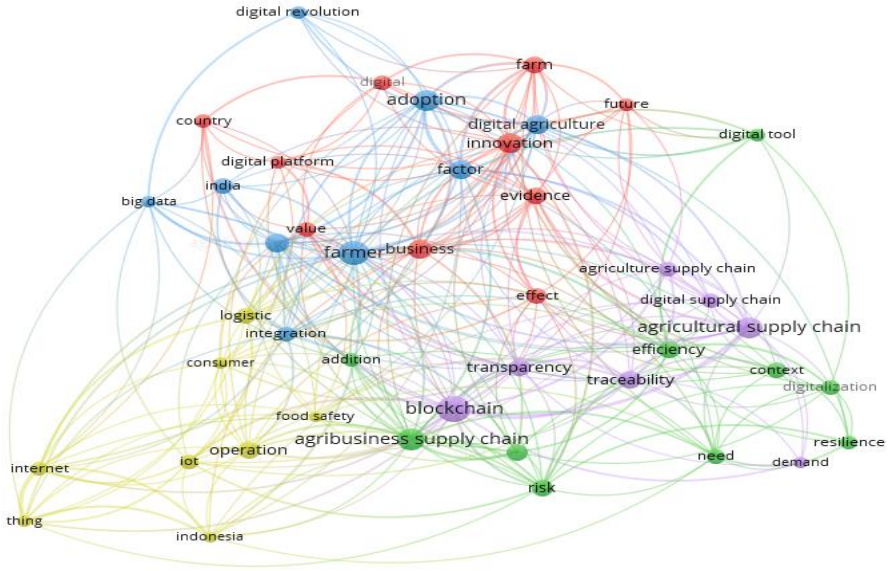

Fig. 2. Network visualization based on mapping on keywords.

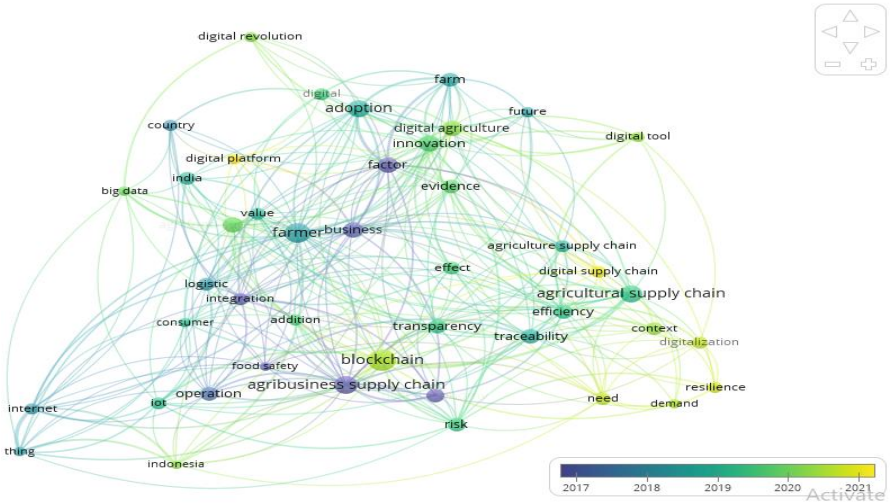

Fig. 3. Visualization overlay based on research trends.

Some of the studies that discuss the themes above one of them is regarding the use of machine learning algorithms to deal with integrated production and distribution scheduling problems [19, 20] and association rule mining to identify cloud-based storage location issues for the distribution and storage of perishable food products [21] and predicting supply chain risk under uncertainty [22]. ML has

also found application in developing local food supply chains to ensure food safety and sustainability in the logistics network [23, 24].

Digital platforms have a total of 11 strange links, digital supply chains have a total of 15 strange links, blockchain has a total of 26 strange links, need has a total of 18 strange links, resilience has a total of 9 strange links, demand has a total of 7 strange links and digitalization has a total of 11 strange links. The number on the total strange link shows that the higher the number, the more numerous and stronger the relationships that occur [25].

Figure 4 explains the density visualization of the keywords "agribusiness", "digital", and "supply chain". Several colours appear in Fig. 4, namely yellow, light green, Tosca, and blue. Research that has been carried out is shown in yellow, namely value, farmer, business, blockchain, agribusiness supply chain, agricultural supply chain, innovation, efficiency, operation, and adoption. The yellowish-green colour indicates that research has not been done much, namely digital tools, risk, IoT, things, future, big data, digital revolution, digital supply chain, and consumers. this study gives additional data for the use of bibliometric in giving research trend, as discussed in other reports [26-33].

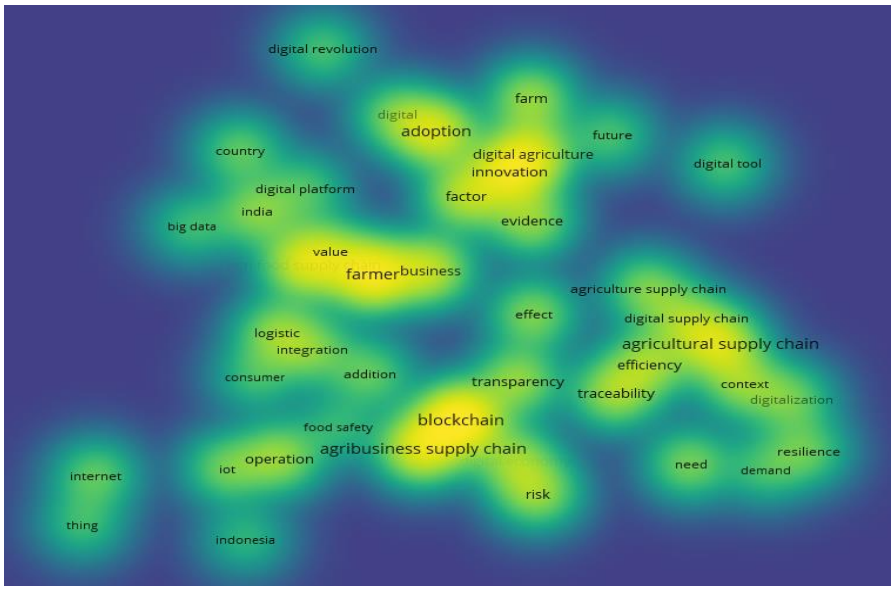

Fig. 4. The density visualization of the keywords.

4. Conclusion

Based on the bibliometric results of the theme of supply chain digitization agricultural products with the keywords “digital”, “supply chain”, and “agriculture”. The results of the bibliometric analysis show that from 2019 to 2022, the trend in the development of the literature on the application of agricultural supply chain digitization has grown rapidly. This happened because, in 2019, the industrial revolution 4.0 was made into a vision by the Indonesian Ministry of Agriculture. Thus, it was adopted into the vision of Agriculture 4.0. This research also proves that there is a relationship between supply chains and agricultural digitization

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