

Bibliometric analysis of watermelon marketing study trends in Indonesia

Tia Sofiani Napitupulu¹, Sumarlina^{1*}, Amalia Dwi Marseva¹, Uni Baroroh Husnudin²

¹Jember State Polytechnic, Jember, Indonesia

²University of Jambi, Muaro Jambi, Indonesia

*Correspondent Author mail: sumarlina@polije.ac.id

Abstract. Watermelon marketing studies play an important role in creating a more efficient and profitable marketing system in an effort to support the development of watermelon farming in Indonesia. Although watermelon marketing studies in Indonesia have covered various aspects such as channels, margins, strategies, and marketing efficiency, there are still limitations in the distribution of research locations and the lack of completeness of the dynamics of subtopic trends longitudinally. The bibliometric analysis method can be used to trace research trends related to watermelon marketing which consists of three stages, namely data collection, data analysis, and data visualization. The selected data is analyzed by comparing the attributes they have. Based on the selection, representative publications only come from 2011 to 2024. Studies related to watermelon marketing in Indonesia show a very fluctuating trend in terms of years. Research topics related to watermelon marketing in Indonesia generally focus on topics related to marketing analysis and specifically focus on the study of marketing channels, marketing margins, marketing strategies, and marketing efficiency in watermelon farming. The locations of research related to watermelon marketing in Indonesia are mostly found on the islands of Java (37%) and Sumatra (33%). However, research related to watermelon marketing is also found in various other regions in Indonesia, namely the islands of Kalimantan, Sulawesi, Maluku, and Madura. In addition, the results of this study also show a trend of shifting subtopics of research related to watermelon marketing.

Keywords: Bibliometric, Marketing Strategy, Watermelon, Farming, Indonesia

INTRODUCTION

Watermelon (*Citrullus lanatus*) is one of the popular horticultural commodities in Indonesia, both in terms of consumption and cultivation. The advantage of this plant lies in its ease of cultivation, especially in dry land with irrigation (Marwoto, 2013). Watermelon can even be cultivated on marginal land such as peatlands (Irawan & Nuzuliyah, 2022; Pangestu & Hidayatullah, 2022; Utomo et al., 2023), coastal sand land (Kuswantoro, 2003; Sasongko & Soejono, 2021; Sembiring, 2019), as well as swamp land (Abubakar, 2018; Simatupang & Rina, 2019). The diversity of cultivation locations shows the flexibility of watermelon as an agricultural commodity that can adapt to various agroclimatic conditions in Indonesia.

Watermelon farming has developed in various regions in Indonesia, from Sumatra to Java and Sulawesi. Several previous studies have shown that watermelon farming has proven to be profitable in various regions such as Sigi Regency (Juprin, 2016), Situbondo (Lukman & Yekti, 2020; Musleh & Mayangsari, 2019) São Paulo, São Paulo (Pranata, 2023), Purworejo (Hermanto et al., 2019), Oku Regency (Agustina & Suryanawati, 2019), Boyolali (Hertini, 2022), and Banjar Regency (Rezani et al., 2024). This reflects that watermelon has bright economic prospects in Indonesia, not only in terms of increasing farmers' incomes, but also in labor absorption. Each hectare of watermelon land can absorb about ten laborers per season (Marwoto, 2013), so that this plant also contributes to socio-economic aspects in various regions.

In addition to its contribution to the economy, watermelon also supports national food security. However, watermelon production in Indonesia in the 2018–2023 period experienced significant fluctuations (Figure 1). Watermelon production peaked in 2020 with a total of 560,317 tons, but declined drastically in the following years as the harvest area decreased. In 2023, the harvest area increased to 31,458 hectares, but watermelon productivity in that year was the lowest over the last five-year period (Central Statistics Agency, 2024). This condition confirms the need for more attention to production management and marketing strategies to ensure market stability and profits for farmers.

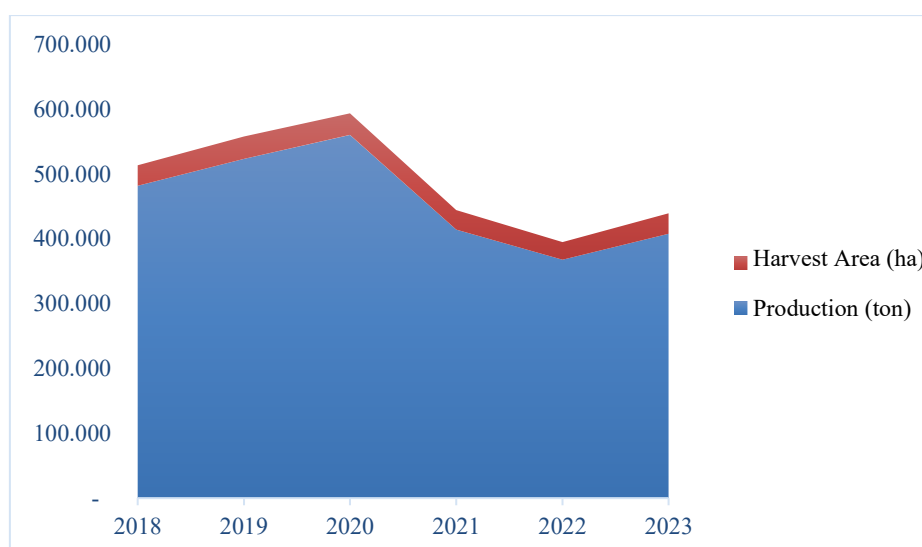


Figure 1. Watermelon Production and Harvest Area in Indonesia in the Period 2018 - 2023

Effective marketing is one of the key factors in the success of watermelon farming. Marketing studies play an important role in ensuring that products can be sold at a reasonable price, reach consumers efficiently, and provide maximum profits for farmers. With its relatively stable demand in local and regional markets, Watermelon has great potential to provide significant economic benefits. However, farmers in remote areas often have difficulty accessing broader markets. Price fluctuations and the length of the distribution chain also add to the challenges farmers face, as additional costs are often imposed by intermediary institutions along the marketing chain (Karina, 2020). Therefore, marketing studies are crucial to identify and address these issues to create a more efficient and profitable marketing system for all parties involved.

In this context, bibliometric analysis is the right analytical tool to trace research trends related to watermelon marketing. Bibliometric analysis is a quantitative method that evaluates scientific publications based on bibliographic data, such as the number of citations, author collaborations, and research trends in a specific field of study. Through this method, this study aims to identify trends in watermelon marketing studies in Indonesia. The research results are expected to provide an overview of the development of research in this field and highlight topics that are still under-discussed for future research.

METHODS

This study uses a bibliometric analysis method consisting of performance analysis and science mapping. Bibliometric analysis, in general, can be defined as a part of scientometrics that utilizes mathematical and statistical methods to analyze scientific activities in a field of study (Jain et al., 2022). The research based on bibliometric analysis is based on data from scientific publications indexed in *the platform-specific* (Sganzerla & da Silva, 2022). The research stages are carried out through several stages, namely data collection, data analysis, and data visualization. The research stages are carried out through several stages: data collection, analysis, and visualization. The three stages use academic analysis software, *Publish or Perish*, and *VOSviewer*. In addition, research was also carried out using the application *Mendeley Reference Manager* to manage publication data more efficiently.

The research began with data collection, which was done using *Publish or Perish* software by first selecting the database used. This study uses *the Google Scholar database* with consideration of affordability, access, and scope of publication. Furthermore, publication data was selected by entering the keyword "*watermelon marketing*" in the *title words* column from 2004 – 2024. The data obtained is then recorded as initial data, then the relevance of each article related to the type of document, duplicate document, and publication title is re-selected. The data from this selection is then re-selected and equipped with its attributes through *the Mendeley Reference Manager*. The completed attributes at least contain the document type, title, author, year of publication, abstract, author keywords, and publisher or journal.

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The data of the final selection articles that have been completed with their attributes are then analyzed manually by the author by comparing the attributes they have. This stage produces data on the trend of the number of temporal publications. At this stage, analysis is also carried out by reading the abstract section in depth to map more detailed information about the published research. This stage produces data on the research location used in the selected publications. The data of the selected articles is then visualized using *the software VOSviewer* to map the keyword network and find out the trends in research developments related to watermelon marketing in Indonesia. The resulting visualization consists of *Network Visualization*, *Overlay visualization*, and *Density Visualization*. VOSviewer assigns attributes (such as keywords) into clusters that describe the network's strength or the keywords' density (Marlina et al., 2023). Moreover, *Overlay visualization* also represents the trend of development of research topics based on keywords temporally so that the trend of studies based on time can be known.

RESULT AND DISCUSSION

Data collection began with a trial using various settings to obtain results in the form of a number of most representative and reliable publications. The settings used include the setting of the publication time range, the word in the *title words* and the keywords. The results of the experiment showed that the best search results were obtained from the 2004-2024 publication time range and the word arrangement in the title (*title words* column) using the keywords "marketing" and "watermelon". The data obtained is then re-selected to be analyzed and visualized, so that an overview of research trends related to watermelon marketing in Indonesia can be obtained.

3.1 Publication Data Metrics

The initial data obtained through a search based on the keyword settings in the title in 2004-2024, then manually re-selected to eliminate irrelevant data based on the title and type of the document, duplicate documents, invalid citations, inaccessible websites, and incomplete publications of attributes. The minimum attributes to have consist of the title, year of publication, publisher, journal name, and abstract. The comparison of the results of the initial data collection with the data of the overall selection results is presented in Table 1.

Table 1. Watermelon Marketing Publication Data Metrics Before and After Selection

No.	Data Metrics	Total	
		Before Selection	After Selection
1	Year of Publication	2007 – 2024	2011 – 2024
2	Number of Articles	35	27
3	Total Citations	67	59
4	Citations per year	3,94	4,54
5	Citations per article	1,91	2,19
6	Authors per article	1,94	2,04
7	h-index	5	5
8	g-index	7	7

Source: Data Processed

Table 1 shows that the selected initial publications were published from 2007 to 2024, but after selection, the representative publications were only from 2011 to 2024. That means that the duration of the research time is shorter. In addition, the number of publication articles related to watermelon marketing research also decreased after the selection. This suggests that some publications are less

relevant to watermelon marketing research, inaccessible, or incomplete in attributes. In line with this, the number of citations has also decreased. However, the number of citations per year, the number of citations per article, and the number of authors per article have increased. That means that even though the period and number of articles are decreasing, publications related to watermelon marketing show a positive trend regarding the number of citations per article, per year, and terms of authors. Conducting this selection is also crucial to gain a more representative perspective on watermelon marketing research trends, ensuring the data quality and the resulting visualization outcomes are more precise.

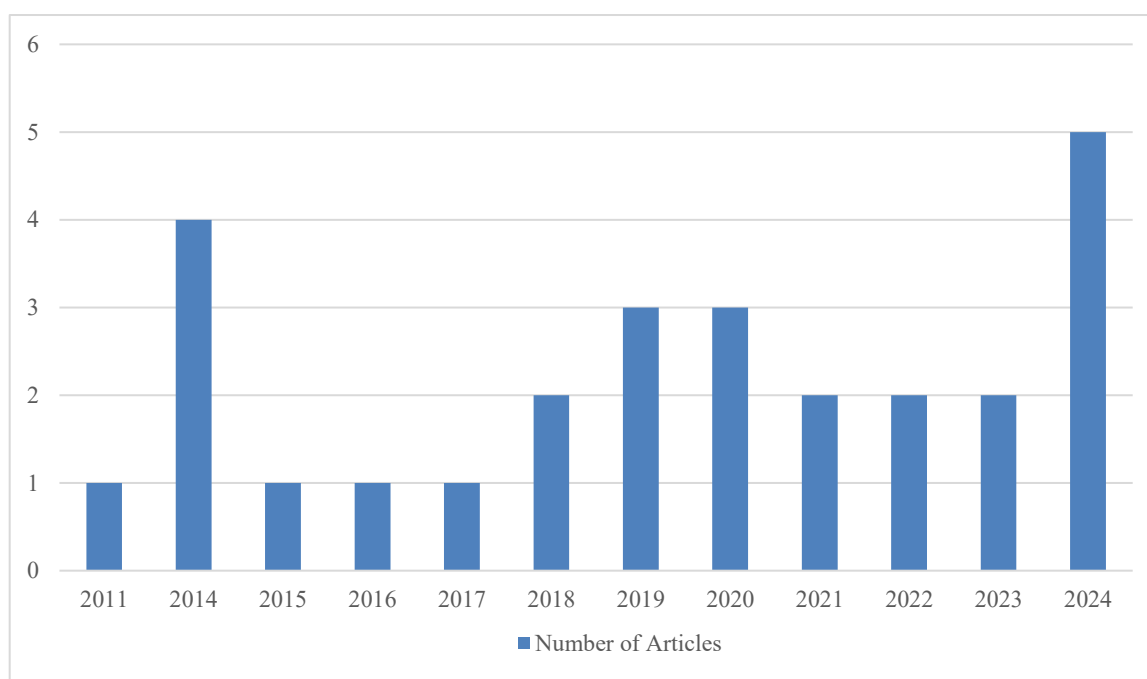


Figure 2. Publication Trends of Watermelon Marketing Research Temporal in 2011-2024

3.2 Temporal Publication Trends

Studies related to watermelon marketing in Indonesia show a very volatile trend when viewed in terms of time (temporal). Figure 2 shows that the number of research publications related to watermelon marketing from 2011 to 2024 has changed dramatically. However, the highest number was found in 2024 which means that watermelon-related research has increased this year. This can be related to the inclusion of watermelon as one of the national strategic fruit commodities based on the results of data collection carried out in 2023 (Central Agency Statistics, 2024). This is an opportunity as well as a challenge for researchers to continue to develop research related to Indonesian watermelon marketing which not only has an impact on the number of publications, but also the quality and quantity of watermelon production nationally.

3.3 Data Analysis of Research Attributes

3.3.1 Research Location

One of the research attributes analyzed in this study is the location of the research in the selected publications. The resulting data is presented in Figures 3 and 4. Figure 3 shows data on the distribution of the number of watermelon marketing research publications in 2011 – 2024 by archipelago, while Figure 4 shows the data on the distribution of the number of watermelon marketing research publications in 2011 – 2024 by province. The most research locations found in publications related to watermelon marketing in Indonesia are on the island of Java (37%), followed by the island of Sumatra (33%).

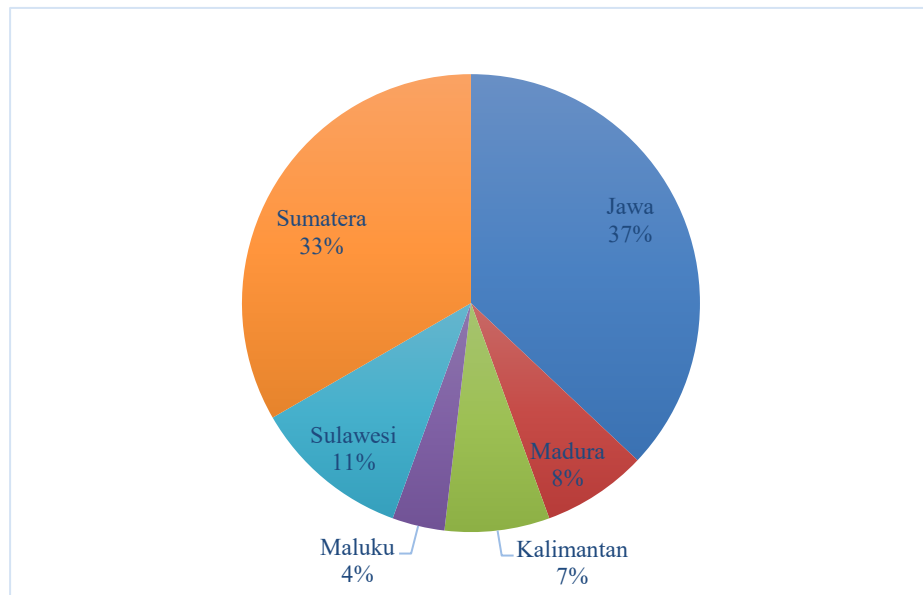


Figure 3. Distribution of the Number of Watermelon Marketing Research Publications by Research Location in 2011-2024 by Islands

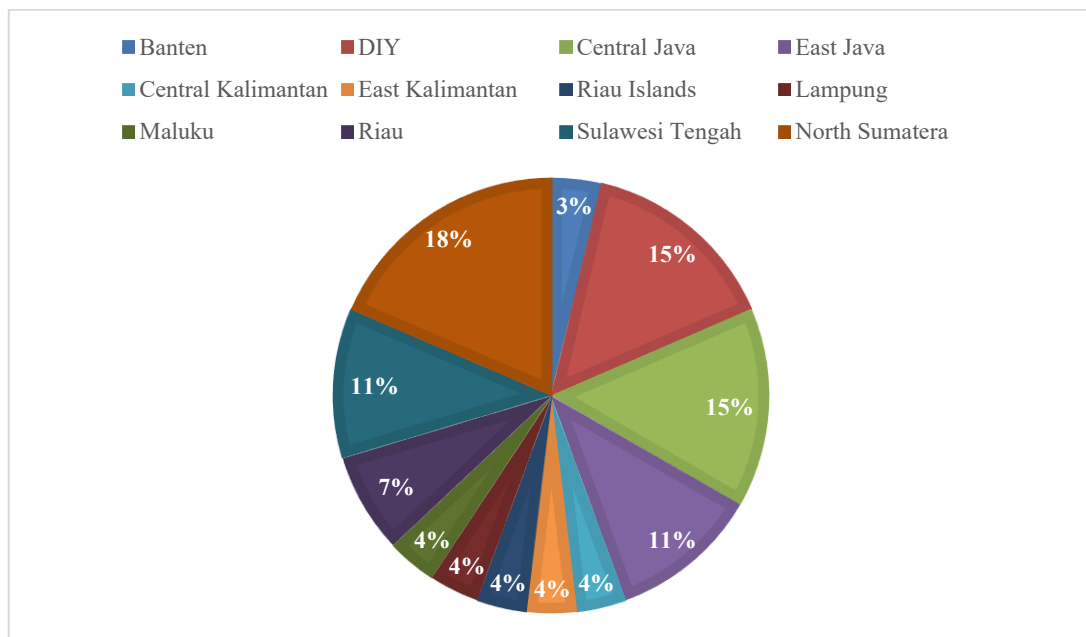


Figure 4. Distribution of the Number of Watermelon Marketing Research Publications by Research Location in 2011-2024 by Province

Figure 4 shows that when viewed by province, North Sumatera became the province with the most marketing research locations (18%) in the period from 2011 to 2024. The research consists of an analysis of aquaculture and watermelon marketing (Hidayah et al., 2021; Hidayah & Handayani, 2023; PA & Andre, 2022), analysis of the production and marketing costs of watermelon farming on farmers' income (Aisyah, 2020), and watermelon marketing strategy (Scott, 2018). The publication of watermelon marketing research for the island of Sumatra was also supplemented by several studies from other provinces, including a SWOT analysis of watermelon marketing in the Riau Islands (Harlan et al., 2021), analysis of revenue, efficiency and marketing of watermelon in Lampung (Efzizal et al., 2011), as well as marketing analytics (Rain, 2022) and marketing margins (Afiza & Syahrantau, 2019) in Lampung.

The second provinces with the highest number of publications are Central Java (15%) and DIY (15%). The Central Java regional publication consists of four publications on watermelon marketing analysis (Hutagaol & Kurniawati, 2023; Musthofa et al., 2019; Mustofa & Mulyatno, 2019; Utami, 2015), while the publication of the DIY region consists of watermelon marketing research (Prasada, 2016; Scott, 2024) and watermelon marketing margin (Astuti, 2014). The dominance of watermelon marketing research locations on the island of Java (Figure 2) is also due to the high publication of watermelon marketing research located in East Java (Amnimarlianda et al., 2018), including research in the Madura Island region (Firman, 2024; Isdiantoni et al., 2020) and Banten (Budianto, 2014).

Watermelon marketing research is also carried out in the Kalimantan Region, namely Central Kalimantan (Marbun et al., 2024) and East Kalimantan (Andayani et al., 2024). On the other hand, Sulawesi Island is also the location of watermelon marketing research, namely in Central Sulawesi Province (Noer & Rauf, 2014; Oberton & Kassa, 2020; Yusnia et al., 2017). Likewise, the Maluku region is a provincial area as well as an island with only one research location related to watermelon marketing (Santoso et al., 2024). Although the number of studies in each province is still small, the research locations are proven to be spread across various regions.

Analysis of data on the location of this study shows that research related to watermelon marketing has been carried out in almost all regions in Indonesia represented through several provinces from the islands of Java, Sumatra, Kalimantan, Sulawesi, Maluku, and Madura. That means that watermelon is one of the commodities widely marketed throughout Indonesia, so it is in line with the determination of watermelon as one of the national strategic commodities. Therefore, research related to watermelon marketing still has considerable opportunities to be carried out in various regions in Indonesia, especially in provincial areas that are not yet in the data. In addition, this location data provides an overview of opportunities for other researchers to conduct development studies in research areas that have been research locations related to watermelon marketing before.

Table 2. Article with the Highest Number of Citations

No	Heading	Number of Citations	Citation
1	SWOT Analysis of Agribusiness Marketing Strategy on Setokok Island (Watermelon Commodity Case Study)	16	(Harlan et al., 2021)
2	Watermelon Marketing Margin Analysis in the Special Region of Yogyakarta	9	(Astuti, 2014)
3	Analysis of Revenue, Efficiency and Marketing of Watermelon (<i>Citrullus Vulgaris</i>) in Tempuran Village, Trimurjo District, Central Lampung Regency	8	(Efrizal et al., 2011)
4	Analysis of Marketing and Income of Watermelon Farming of Ridho Lestari Farmer Group in Tembokrejo Village, Muncar District, Banyuwangi Regency	7	(Amnimarlianda et al., 2018)
5	Analysis of Watermelon Marketing Strategy at the Association of Farmers Groups (Gapoktan) Tani Makmur in Cabean Village, Demak District, Demak Regency	5	(Mustofa & Mulyatno, 2019)

Source: Data Processed

3.3.2 Highest Number of Citations

Table 2 presents the five articles with the highest number of citations. Based on the data presented in Table 2, the five articles with the highest number of citations show a primary focus on marketing strategy, margin analysis, and marketing efficiency. Analysis with the highest number of citations (Harlan et al., 2021), discussing agribusiness marketing strategies on Setokok Island using the SWOT method. The main focus of the article is on SWOT analysis as a tool to identify strengths, weaknesses, opportunities, and threats in watermelon agribusiness marketing. The numerous citations in this article show that the strategic approach in the marketing of horticultural commodities has received considerable attention from researchers.

In addition, other articles that also received high citations (Astuti, 2014), with a total of nine citations, discussing the watermelon marketing margin in the Special Region of Yogyakarta. The study

highlights margin inequality between manufacturers and retailers, as well as the factors that affect prices at the consumer level. These findings can be used as a basis for further research in order to improve distribution systems and improve marketing efficiency, especially to ensure watermelon farmers get a fairer benefit from the distribution chain. Another study that ranks third by most citations (Efrizal et al., 2011), focusing on marketing efficiency in Central Lampung. This study shows how efficiency in marketing can directly contribute to farmers' incomes. Efficiency in distribution will increase the net income received by farmers. This research is important in supporting policies that support the reduction of long distribution chains, thereby providing more benefits to farmers. On the other hand, two other articles (Amnimarlianda et al., 2018; Mustofa & Mulyatno, 2019), also focusing on marketing strategies and watermelon farming income in Banyuwangi and Demak. These two articles discuss the importance of planning marketing strategies involving farmer groups to create effectiveness at scale. All of these publications can provide an overview of studies related to watermelon marketing that have existed before.

3.4 Keyword Mapping Visualization

The results of the visualization of network mapping based on the keywords of watermelon marketing research in Indonesia (Figure 5), show that the most frequently appearing keyword is "marketing", which is at the center of the network and has many connections with other keywords. These keywords connect different aspects of marketing, such as marketing channels, margins, and farmers. The connection between "marketing", "marketing channel", and "farmer" is very visible in this network, where the keyword is linked to several other keywords, such as trader, and farming. This shows that research on watermelon marketing focuses a lot on the distribution of agricultural products (marketing channels) and its impact on farmers' welfare. The relationship between "marketing channels" and "margins" is also quite strong.

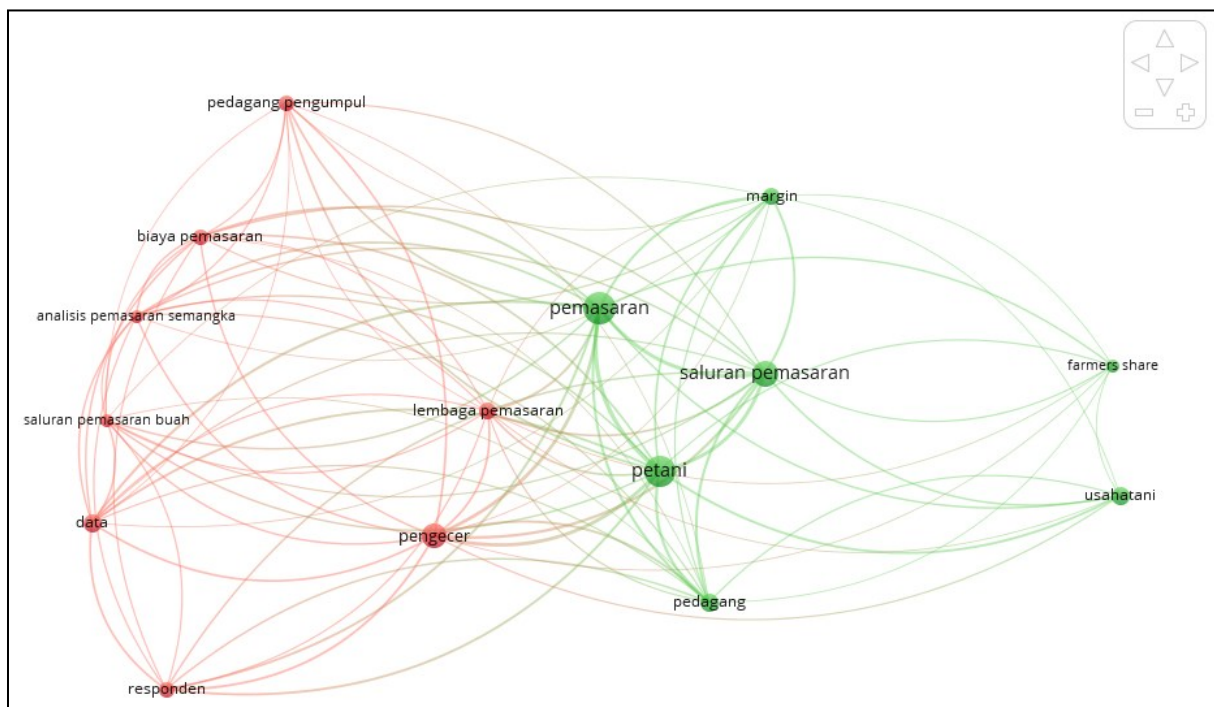


Figure 5. Network Mapping based on Watermelon Marketing Research Keywords in Indonesia

The keywords "merchants", "marketing agencies", and "collector merchants" also have significant networks, suggesting that these keywords are often mentioned in the context of watermelon distribution and marketing channels. The involvement of collectors and marketing agencies in the watermelon marketing process shows that the research focuses on the role of such institutions in the watermelon supply chain. Meanwhile, some keywords, such as "watermelon marketing analysis" and "marketing cost" appear to be less connected to the main keywords.

Based on the visualization of the network provided, it can be stated that there are two main groups (*Clusters*), which are distinguished by color. *This cluster* shows how the keywords are connected. *The First Cluster*, characterized by green, with the main keywords "marketing", "marketing channel", and "farmers". *This cluster* shows that watermelon marketing research in general focuses on aspects of distribution, marketing channels, and the impact of marketing margins on farmers' welfare. *The second cluster*, characterized by red, with the main keywords "marketing costs", "marketing agencies", "traders". *This cluster* focuses on the cost and role of marketing agencies in watermelon marketing. Research in this *cluster* may aim to identify marketing channels, find out the involvement of marketing agencies in marketing channels, and analyze marketing costs.

The Overlay *visualization* in Figure 6 shows the network of keywords related to watermelon marketing in Indonesia in the period 2018 to 2023. Based on the image, the keywords "marketing", "marketing channel", and "farmer" emerged as the main nodes, suggesting that these topics are important in research on watermelon marketing. The color difference in the visualization indicates keyword development, where blue indicates words that appear earlier, while green and yellow color indicate keywords that appear later. The keywords "farmers", "marketing channels", "marketing", and "margins", indicate that these topics have emerged earlier. Meanwhile, the keywords "marketing costs", "marketing agencies", and "marketing analysis" received a lot of attention in the latest research.

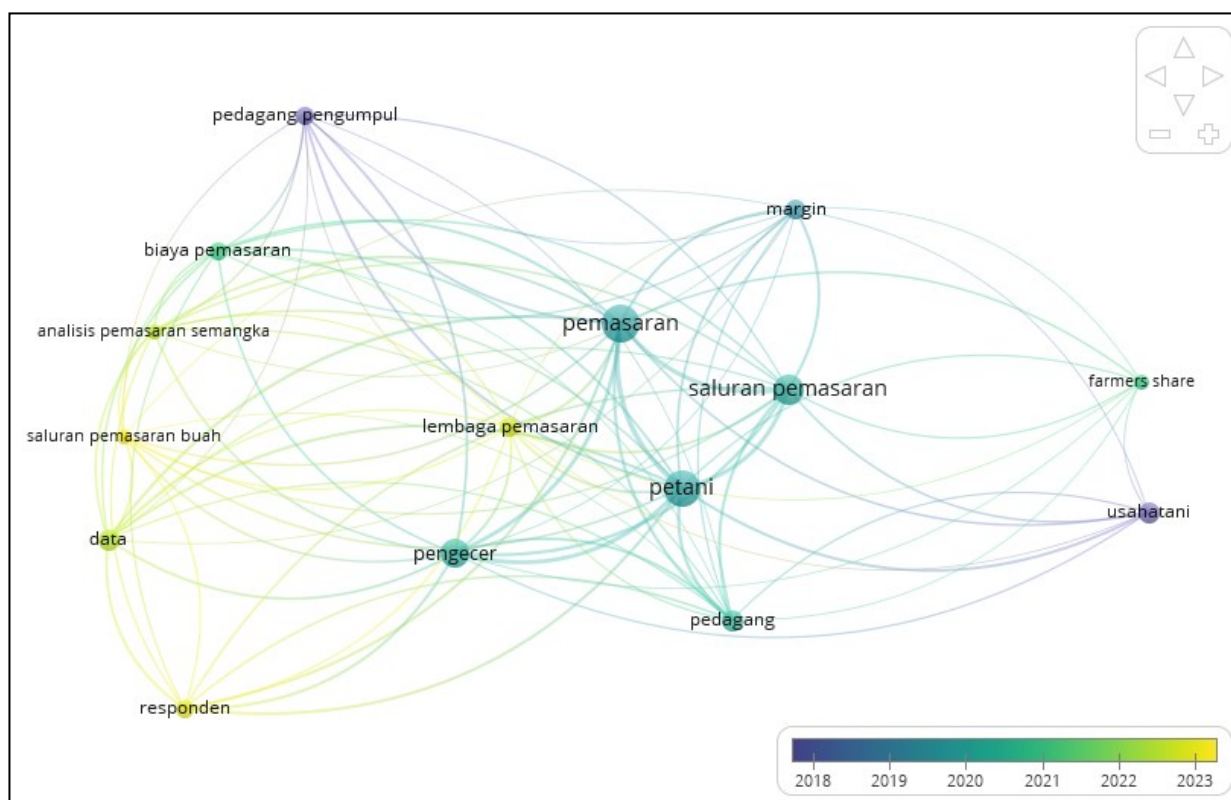


Figure 6. Watermelon Marketing Research Overlay Visualization Based on Keyword Network

The visualization of keyword density (Figure 7) shows the intensity distribution of topics related to watermelon marketing in Indonesia; the yellow indicates the keywords that appear most often and become the center of discussion. Meanwhile, green to blue colors indicate less dominant keywords. The keywords "marketing," "marketing channel," and "farmers" were seen hanging out with the highest density, indicating that the primary focus lies on the relationship between farmers and the watermelon marketing system in Indonesia. On the other hand, the keywords "watermelon marketing analysis," "marketing cost," and "fruit marketing funnels" have a lower density yet are relevant in watermelon marketing discussions.

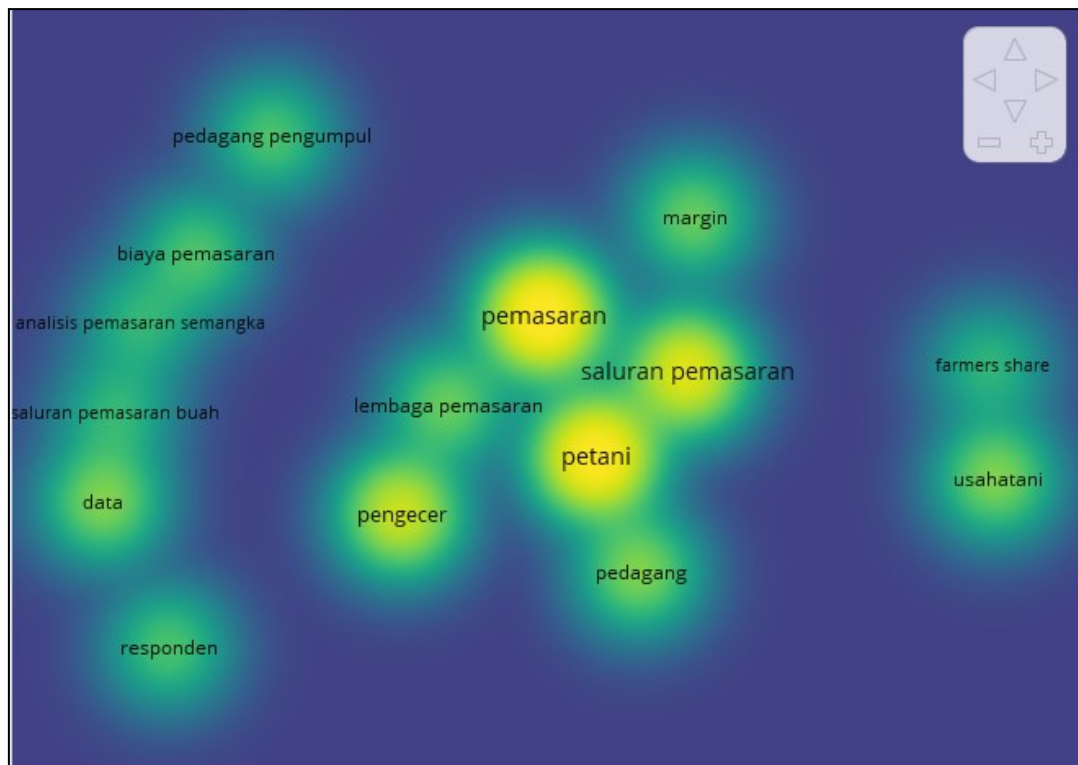


Figure 7. Watermelon Marketing Research Density Visualization Based on Keyword Network

CONCLUSION

The results of this study show that research related to watermelon marketing in Indonesia generally focuses on topics related to marketing analysis and specifically focuses on the study of marketing channels, marketing margins, marketing strategies, and marketing efficiency in watermelon farming. The highest number of publications will be in 2024. Throughout 2011 to 2024, the location most widely used for watermelon marketing research is the Java Island area. However, research related to watermelon marketing has also been found in various other regions in Indonesia such as on the islands of Sumatra, Kalimantan, Sulawesi, Maluku and Madura. The results of the network mapping by keywords showed the grouping of keywords into two *clusters*, namely keywords that focus on distribution aspects, marketing channels, and the impact of marketing margins on farmers' welfare, and keywords that focus on costs and the role of marketing institutions in watermelon marketing. The results of the *overlay* visualization show a trend of shifting topics from "marketing", "marketing channels", and "farmers" to more highlighting "marketing costs", "marketing agencies", and "marketing analytics". Likewise, the density visualization shows that the main topics in the watermelon marketing study in Indonesia are centered on keywords such as marketing, marketing channels, and farmers. Other keywords related to cost and marketing analysis appear with lower density, but remain relevant in the discussion. These results can be an illustration of the development trend of watermelon marketing studies in Indonesia for researchers and developers of watermelon farming.

Based on the existing results, forthcoming studies should focus on extending the geographical range beyond Java to include various regional marketing methods and obstacles. Interdisciplinary methods that combine agricultural economics, marketing, and rural development are crucial for a deeper understanding of the institutional frameworks influencing watermelon marketing. Additionally, exploring the use of digital marketing technologies and the impact of farmer organizations may provide creative strategies to improve market efficiency and benefit farmers' welfare. Longitudinal research assessing the enduring effects of marketing initiatives is also essential to bolster sustainable agricultural policies and practices in Indonesia.

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