

The Trend of Digital Marketing in Agriculture : A Bibliometric Analysis

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Abstract : The primary objective of this analysis was to scrutinize bibliographic material, aiming to discern trends and prioritize areas for the investigation of digital marketing in agriculture. The Scopus database was utilised for storing and analysing bibliographic data related to digital marketing in agriculture. The data underwent processing and visualising using Scopus tools, allowing for grouping based on publication frequency and creating graphical representations. VOS viewer software was employed to construct network maps illustrating keyword connectivity, author collaboration, and the temporal dimension of research in 83 scientific publications. Derived from the outcomes of the research, conclusions were made regarding the fluctuations in the quantity of digital marketing publications within the agricultural domain, nations exhibiting the highest publication rates, universities with the most extensive publication records, prominent journals, prolific authors, and frequently occurring keywords in research, as well as analyzing opportunities and exploring additional digital marketing studies. The increasing trend in digital marketing research in agriculture over the past 5 years, particularly in China, suggests a growing interest. While current publication numbers are modest, this underscores untapped research opportunities. Future studies can explore effective digital marketing strategies in China's agricultural markets, enhance publication quality, and delve into methodologies employed by leading researchers. Additionally, there is potential to develop models to improve marketing efficiency in the agricultural sector. Recognising major contributors and identifying key keywords provide a foundation for in-depth research, fostering international collaboration for innovative development.

Keywords : *Digital Marketing, Agriculture, Bibliometric Analysis*

1. Introduction

The integration of digital marketing in the agricultural realm functions as an indicator that directs the indirect optimization of global food supplies. However,

agricultural stakeholders are often trapped in conventional agricultural marketing practices. This digital transformation opens new opportunities to connect agricultural producers with consumers, to enhance operational efficiency, and to expand market reach. Digital marketing is a widely adopted form of marketing for promoting products or services and connecting with consumers through digital channels. It goes beyond internet marketing, encompassing channels that do not rely on the internet. This comprises mobile phones (including SMS and MMS), social media marketing, display advertising, search engine marketing, and various other types of digital media (Yasmin, Tasneem and Fatema, 2015).

In the context of agriculture, digital marketing refers to a variety of digital marketing tactics in addition to the online promotion of agricultural products. Agriculture may increase its visibility, lower barriers to distribution, and give consumers clear information by implementing information technology. Producers gain from this, but also improves the relationship between farmers and consumers, who are becoming more aware of where their food products come from. Agricultural product marketing is thought to be exceptional and deserving of special consideration. Using a variety of digital marketing strategies, the main goals of digital marketing are to promote companies, create preference, and boost sales (Bojkić and Čut, 2016).

Examples of utilising digital media for marketing agricultural products are evident in India, where the government has initiated several programmes and launched platforms such as eNAM and the Agri Market App. These endeavours aim to encourage stakeholders to efficiently utilise resources and establish digital connections. This effort proves beneficial for both rural and urban farmers, enabling them to engage with a significant number of buyers and showcase the quality and variety of their products and services. Consequently, this facilitates the generation of more leads and revenue.

Various digital platforms are available to assist entrepreneurs, start up, and forward-thinking farmers in their digital marketing efforts. In addition to these platforms, specific tools and techniques can be strategically employed to connect with a targeted customer base. Digital marketing presents numerous advantages and opportunities for exploring new markets and expanding reach to a global audience. While challenges related to infrastructure and connectivity persist in rural areas, overcoming these hurdles can enable agricultural companies to leverage the benefits of

digital marketing and enhance business growth, engine marketing, and various other types of digital media (Deshmukh and Patil, 2021). The development and utilisation of digital marketing media for agricultural products are crucial for enhancing visibility, reaching a broader market, and building consumer trust. Through digital strategies, producers can effectively market their products, engage directly with consumers, and respond quickly to market dynamics. Consequently, digital media has become a strategic key to marketing agricultural products in the digital era.

The purpose of this article is to investigate digital marketing trends and problems in the agriculture sector and to identify a network of collaboration between authors based on their belonging to a certain country, who are engaged in research in this field. Furthermore, researchers can use fresh data from the digital marketing trend as a reference to carry out additional research. To accomplish the objective, the research is directed towards addressing the following tasks:

1. The research aims to identify trends in the publication of articles dedicated to digital marketing in agriculture,
2. The research aims to identify research trends related to digital marketing in agriculture.

2. Methodology

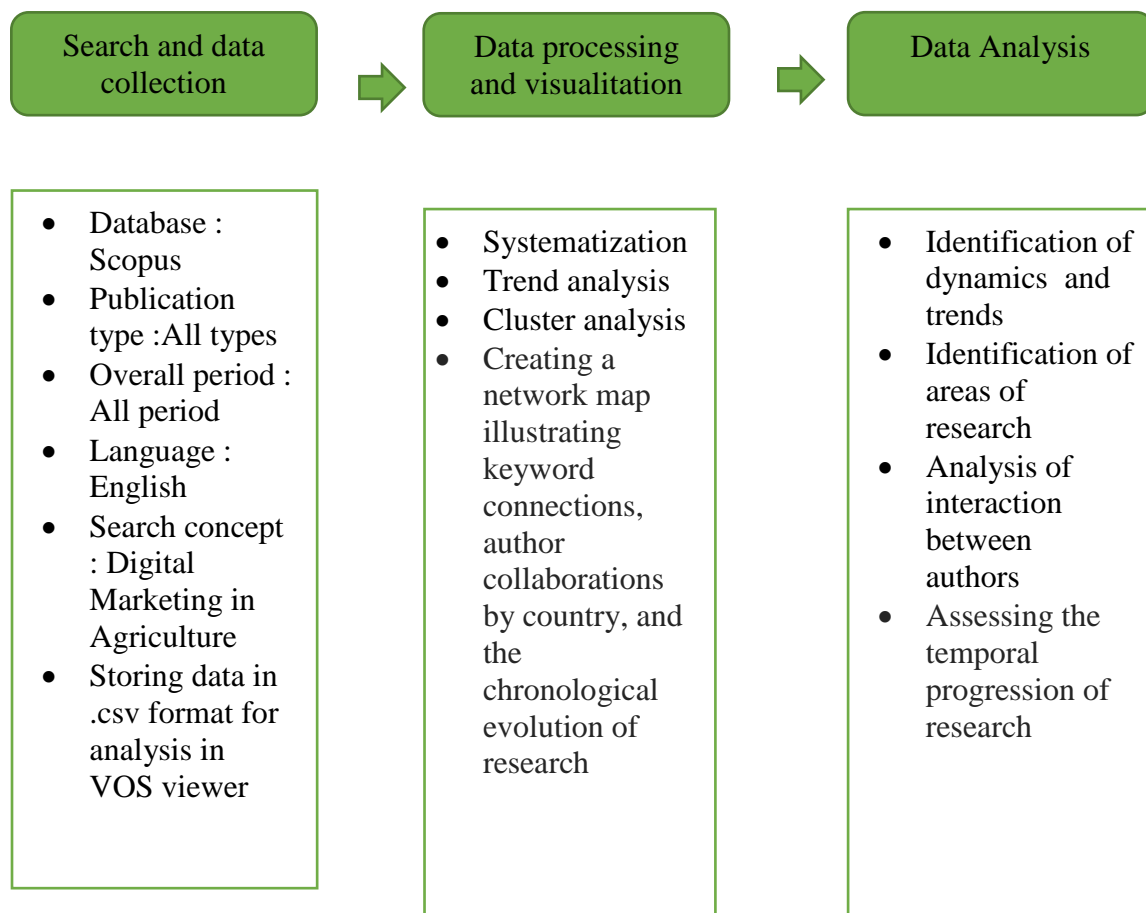
One approach to assessing the outcomes of scientific investigations involves employing bibliometric analysis. Bibliometrics is a field that utilises mathematical and statistical techniques to examine the dissemination of scientific documents, aiming to discern patterns in the progression of subject domains, authorship attributes, and the reciprocal impact of publications. Through bibliometric analysis, researchers can scrutinise and depict essential features of published articles, unveiling research patterns within a specific domain by leveraging online literature databases (Ellegaard and Wallin, 2015).

Scientific mapping is a facet of bibliometric analysis that reveals relationships among the elements within a study (Downing *et al.*, 2022). This analysis delves into the intellectual interactions and structural interconnections among the research objects (Mrykhina *et al.*, 2020). Various scholarly mapping techniques, such as citation analysis, co-citation analysis, bibliographic collation, word analysis, and co-authorship analysis,

are employed. When integrated with network analysis, these methods become crucial in illustrating both the bibliometric and intellectual structures within a particular field of study (Marín-Palacios and Fullat, 2022) and (Baker, Kumar and Pandey, 2021).

To examine advancements in scientific research related to digital marketing in agriculture, this study was carried out through a series of stages, as illustrated in figure 1.

Figure 1.



In the initial phase, an exploration was conducted to identify the most pertinent publications within the Scopus scientometric database. The choice to Scopus was made due to the higher abundance of journals and citations in comparison to the Web of Science. There is no year limit when choosing the research period, so take all the studies that fit the keywords. In determining keywords, two search strings related to digital marketing and agriculture were utilised, and the specifics of these strings are outlined in

Table 2. Throughout the recording process from the database sources, a total of 92 articles were accumulated.

Table 1. Digital Marketing in Agriculture

Topic	String
Digital Marketing	("Digital Marketing" OR " Digital Advertising" OR "Online Marketing" OR "Online Advertising" OR "Internet Marketing "OR "Internet Advertising" OR "Sosial Media Marketing")
Agriculture	("Agricultural" OR "Agriculture " OR "Farming") ("Digital Marketing" OR " Digital Advertising" OR "Online Marketing" OR "Online Advertising" OR "Internet Marketing "OR "Internet Advertising" OR "Sosial Media Marketing") AND ("Agriculture" OR "Agriculture" OR "Farming")

The next step, referred to as journal demographic filtration, involved screening databases and defining inclusion and exclusion criteria. These criteria comprised two inclusion factors and two exclusion factors. Articles had to be written in English to meet the inclusion criteria, while literature was excluded if it was not in English, was non-academic, and was a collection of proceeding articles that were difficult to process. Out of the initial ninety-two articles, only 83 successfully met the screening criteria.

The Scopus database, renowned for its comprehensive coverage of scholarly literature, facilitates the preservation of bibliographic data for subsequent analysis. This invaluable information is meticulously stored in the widely supported .csv format, aligning seamlessly with the specifications of the VOS viewer software. This format ensures accessibility and compatibility, allowing researchers and analysts to delve into the wealth of bibliographic content and derive meaningful insights through the powerful visualization capabilities offered by VOS viewer.

Data acquired from the Scopus database underwent processing and visualization. The grouping and visual representation of the data were accomplished using the "Analyse search results" tool within the Scopus database. Additionally, utilising the same tool, data grouping based on the number of publications over distinct time periods

was performed. These grouped data sets were then employed for creating graphical representations, elucidating the dynamics and structure of publications.

To visually represent the thematic focus of scientific advancements, a method involving the visualization of similarities was employed. The study utilized the VOS viewer software to construct network maps illustrating keyword connectivity, author collaboration by country, and the temporal dimension of research. The results, comprising 83 scientific publications, were imported into the VOS viewer program.

The analysis conducted within the VOS viewer program aimed to identify the frequency of shared usage of terms in the titles and keywords of scientific publications by researchers. This process marked the third stage of the study, wherein data analysis was performed to address the research questions initially posed at the onset of the study.

3. Result and Discussion

A. Trends in Publications

Figure 2 illustrates the results of publication trends in the realm of digital marketing within the agriculture sector. The research data indicates a collective count of 83 papers. Table 1 complements the findings depicted in Figure 2.

Figure 2 Publication Trends

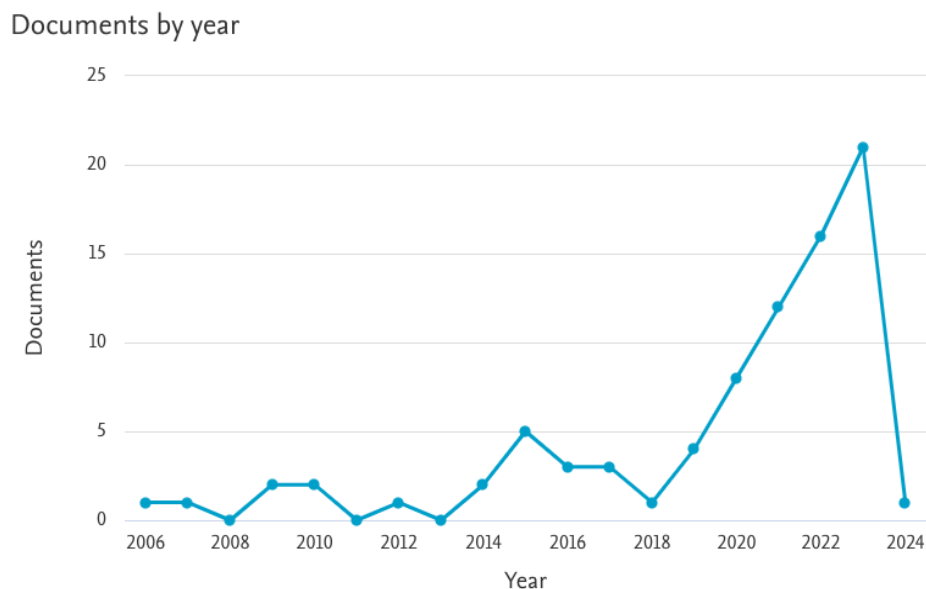


Table 2. Publication Trends

No	Year	Publications	No	Year	Publications
1	2006	1	11	2016	3
2	2007	1	12	2017	3
3	2008	0	13	2018	1
4	2009	2	14	2019	4
5	2010	2	15	2020	8
6	2011	0	16	2021	12
7	2012	1	17	2022	16
8	2013	0	18	2023	21
9	2014	2	19	2024	1
10	2015	5			

Table 2's statistics indicate that, with 21 papers, 2023 was the most productive year. This data demonstrates the growing interest in the trend of digital marketing in agriculture. From 2006 to 2018, the number of publications related to digital marketing in agriculture did not increase at all. Even in 2008, 2011, and 2013, there were no publications, or the number of publications was 0. Meanwhile, from 2019 to 2023, the number of publications increased continuously. This indicates a trend in the use of digital marketing in the agricultural sector. However, in this year's period, the number of publications is still very small. This shows that the digital marketing trend in agriculture has not been widely discussed by the public at large and digital marketing is something new for agriculture so not many people are familiar with it. This can also be seen in research (Subiyantoro *et al.*, 2023) conducted in Indonesian agriculture showing that farmers still sell their agricultural products manually.

B. Primary Nations in Agricultural Digital Marketing

Numerous countries have released noteworthy research on the application of digital marketing in agriculture. An examination is undertaken to assess the outcomes and impacts of the leading countries in this field from 2006 to 2024. Figure 3 presents the published findings from the top 10 countries in the context of digital marketing in agriculture, arranged by the quantity of papers. In instances of a tie, priority is given to the country with the most recently published work.

Figure 3. Primary Nations in Agricultural Digital Marketing

Documents by country/territory

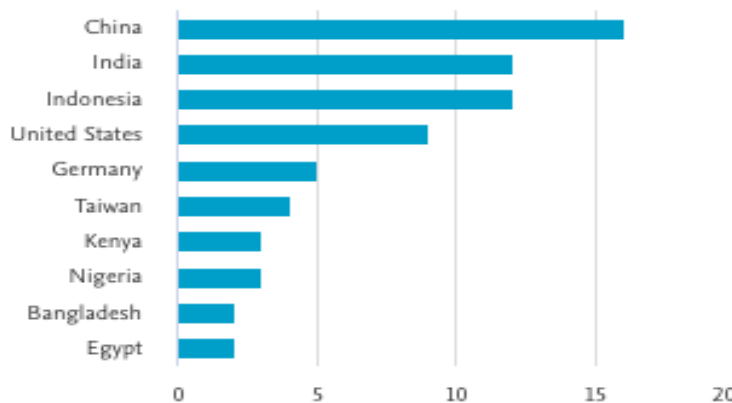


Table 3. The most productive countries and regions

Rank	Country/ Region	Publications	Citations
1	China	16	62
2	India	12	10
3	Indonesia	12	4
4	United States	9	15
5	Germany	5	11

Table 3 reveals that China emerged as the most prolific nation, contributing 16 papers with a total of 62 citations. This indicates a robust academic engagement in research concerning digital marketing in agriculture within the Chinese scholarly community. India secured the second position with 12 publications and 10 citations, followed closely by Indonesia, which also had 12 publications but with 4 citations. Similarly, the United States claimed the fourth spot with 9 publications and 15 citations, while Germany, with 5 publications and 11 citations, secured the fifth rank in the realm of digital marketing in agriculture.

Figure 4 illustrates the outcomes of bibliometric connections. Each circle within the figure corresponds to a specific nation, with the size of the circle reflecting its productivity—the larger the circle, the more prolific the nation. Notably, China

stands out as the most productive country, showcasing significant bibliometric connections with other nations. The size of China's circle suggests it has substantial and crucial bibliometric ties with other countries in the context of the study.

Regarding the nations, Figure 5 illustrates the co-authorship associations. It is important to note that co-authorship provides insights into both the scale of a country's publications and its significant collaborations with other nations. In Figure 5, the absence of co-authorship connections between the represented countries indicates a lack of collaborative writing or joint authorship in the analysed period or on the specified topic. The absence of lines or links between the countries suggests that each country conducted its research or produced publications independently, without engaging in collaborative efforts in terms of authorship.

In the future, there may be a need for collaboration between countries to create new research related to digital marketing in the agricultural sector. Therefore, it is hoped that in the future it will be able to create new digital marketing opportunities for farmers more widely.

Figure 4. Bibliographic coupling of countries

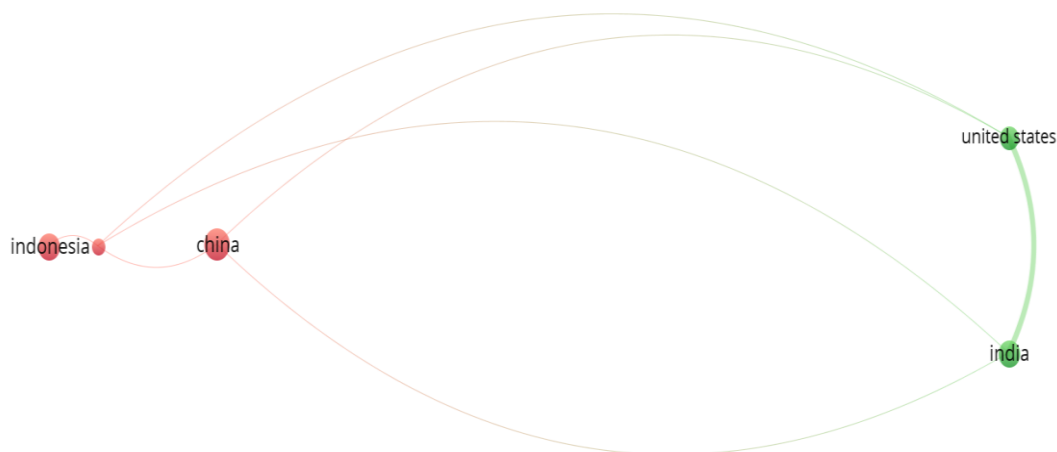


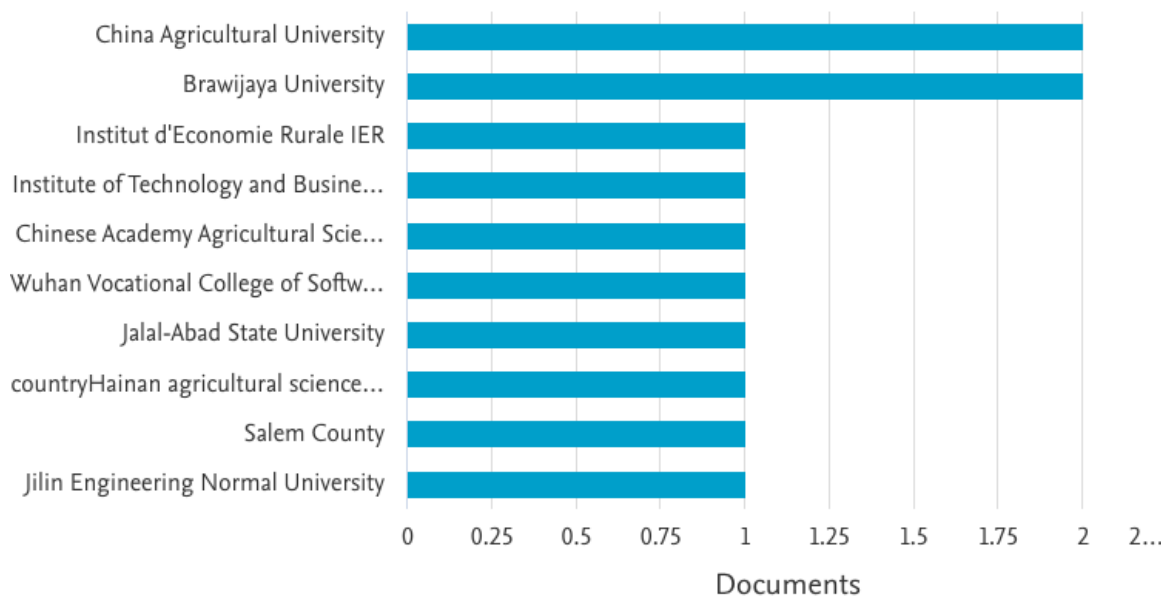
Figure 5. Co – authorship among countries



a. The Most Productive Institutes and Universities

One of the most important aspects of bibliometric analysis is seeing which universities are the most productive. However, in this bibliometric analysis, research related to digital marketing in agriculture is still minimal. This can be seen from the number of documents published by each university. In first place, they are China Agricultural University and Brawijaya University, with two published documents. while in second place, they are the Institute of Technology and Business, Chinese Academy Agriculture Science, Wuhan Vocation College, Jalal-Abad State University, Hainan Country Agriculture Science, Salem Country, and Engineering Normal University with 1 publication document.

Figure 6. The Most Productive Institute and Universities



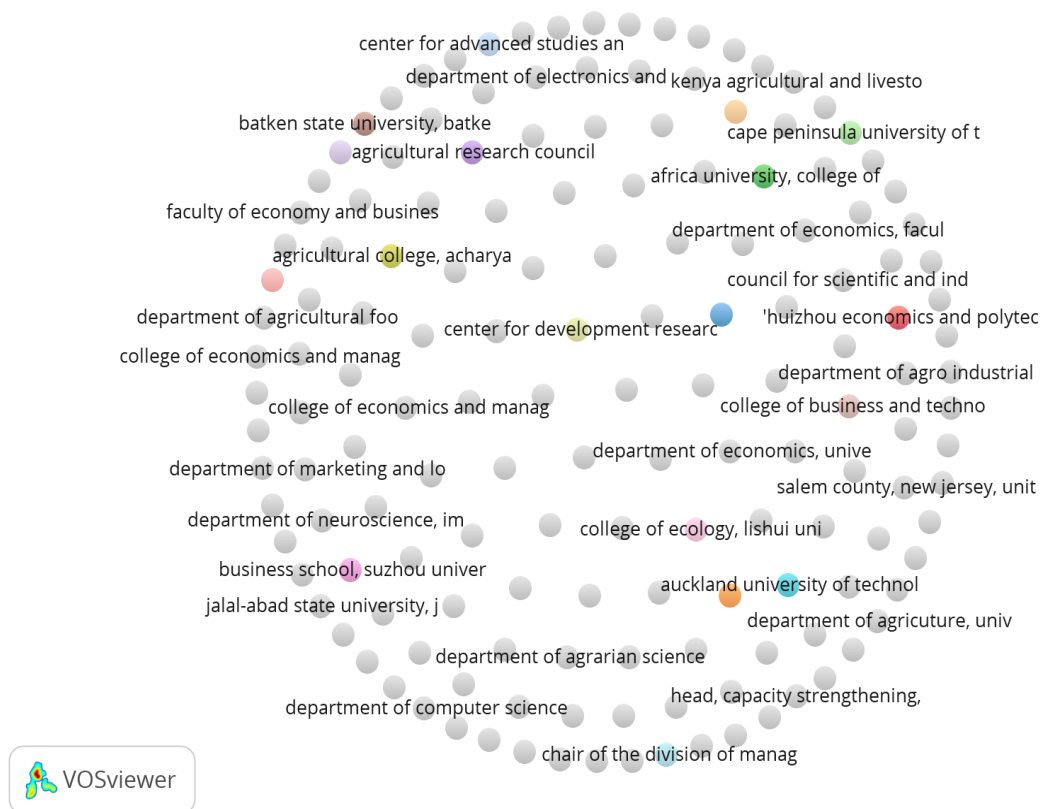
To advance research in digital marketing in agriculture, strategic steps are essential. Universities need to stimulate interest through incentives and financial support. Collaboration among universities is crucial to expanding networks and sharing resources. Involving the agricultural industry in research supports innovative solutions and practical insights. Specialised education and training programmes are necessary to encourage new researchers. Additional financial resources can be obtained through collaboration with governments and non-profit organizations. Focusing on specific challenges and opportunities provides relevant direction. Institutional support and advocacy for the government sustain ongoing research. International collaboration brings a crucial global perspective to digital marketing in agriculture.

b. Leading Journal

Another crucial aspect of the bibliometric review involves examining the most influential sources, specifically those conducting a higher volume of research in digital marketing within the agricultural domain than their counterparts. The absence of a dominant journal in co-citation indicates that there is no specific journal significantly cited or connected with other journals in the research on digital marketing in the agricultural sector. This can be attributed to various factors, including the diversity of

topics or research methods or the lack of a particular journal that distinctly leads in that domain.

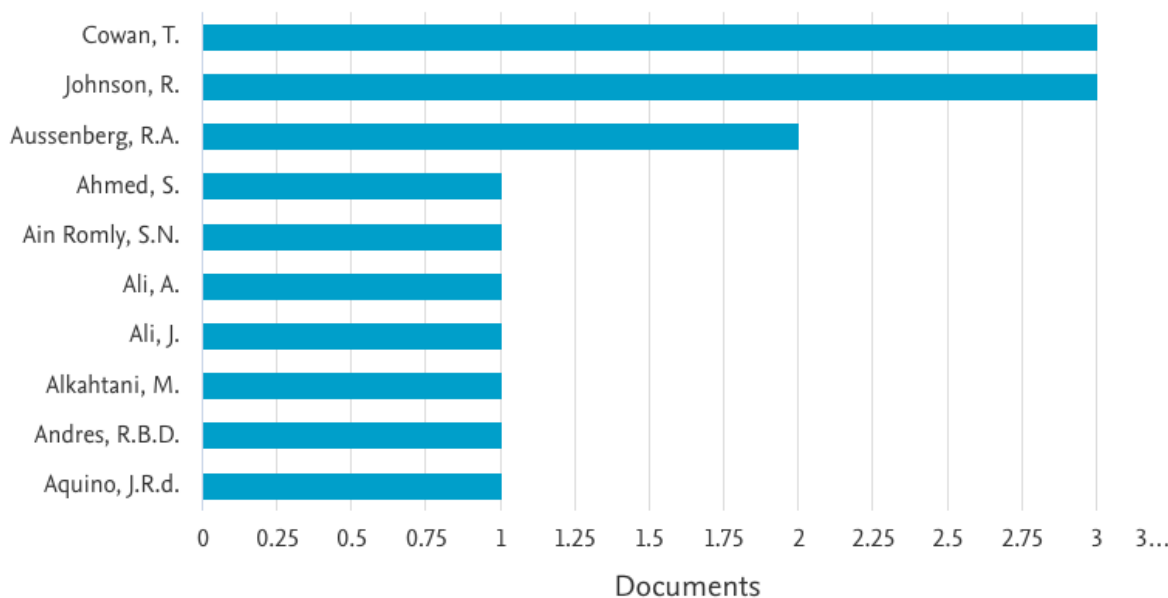
Figure 7. Co Citation of Leading Journal



Co-citation analysis reveals the absence of a dominant journal in digital marketing in agriculture. This reflects the diversity of research and the potential interdisciplinary nature of this field. The lack of journal dominance also indicates that the field is still evolving and that researchers have not converged around a central publication. This may be linked to the dynamic nature of digital marketing and its ongoing exploration. As the field grows, it will be interesting to see if specific journals become focal points and how co-citation patterns develop over time.

Figure 8. The Most Productive Authors on Digital Marketing in Agriculture

c. The Most Productive Authors on Digital Marketing in Agriculture



To identify the leading contributors in the field of digital marketing in agriculture, Figure 8 visualizes the outcomes. Cowan and Johnson secure the top positions in the ranking, each with 3 publications. Following closely is Aussenberg with 2 publications, and in the third position, individuals such as Ahmed, Ain Romly, Ali A, Ali J, Alkahtani, Andres, and Aquino each have 1 published document.

The distribution of publications among these contributors provides insights into the collaborative and multidisciplinary nature within the research community of digital marketing in agriculture. The varying publication counts also encourage further exploration regarding specific focus areas, methodologies, and the impact of their contributions. This analysis helps map the landscape of influential contributors, opening opportunities for potential collaboration, identifying research gaps, and gaining a deeper understanding of emerging trends in this evolving field.

d. Co-word analysis of high-frequency keywords (frequency > 5)

Altogether, 83 pieces of literature were introduced into VOS Viewer to conduct co-occurrence analysis of keywords, resulting in the generation of a keyword co-occurrence network map illustrated in Figure 9. The network map encompasses 627 keyword nodes. As per the outcomes from VOS viewer processing, a total of 12 keywords are identified with high frequency.

Table 4. Co – Word Analysis of High- Frequency Keywords

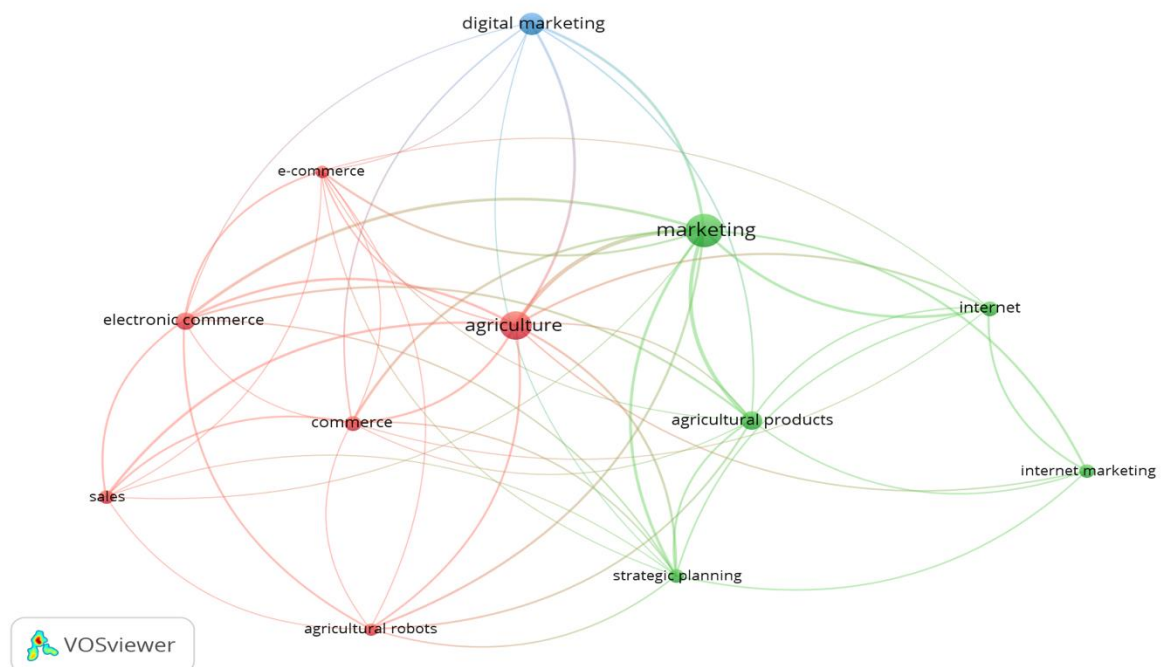
Sequence number	High-Frequency Keyword	Frequency	Sequence number	High-Frequency Keyword	Frequency
1	Marketing	32	7	Internet	7
2	Agriculture	24	8	Strategic planning	6
3	Digital Marketing	14	9	Sales	6
4	Agricultural Product	10	10	Internet Marketing	6
5	Electronic Commerce	9	11	Agricultural robots	5
6	Commerce	7	12	e- commerce	5

As per the findings in Figure 9, the categorization of keywords into three clusters was achieved, delineating the primary research directions in digital marketing within agriculture. The most extensive cluster, represented by the colour red, encompasses a total of six keywords. The red cluster, encompassing keywords such as "ecommerce," "electronic commerce," "sales," "agriculture," "agriculture robot," and "commerce," indicates a research focus in digital marketing within the agricultural sector closely tied to business and online marketing aspects. Additionally, this cluster signifies an association with the implementation of technology, particularly robotics, in agricultural practices. The integration of business elements with the agricultural sector, particularly in the context of digital marketing, is a central theme within the research highlighted in this red cluster.

While in the blue cluster, the keyword "digital marketing" indicates a specific focus on research or literature discussing aspects of digital marketing in the context of agriculture.

The green cluster with keywords "marketing," "internet," "internet marketing," "strategic planning," and "agriculture product" indicates an interconnection and research focus on how marketing concepts, especially through the internet, along with strategic planning, can be applied in the context of agricultural products.

Figure. 9 The Co - Occurrence Network Mapping of High Frequency Keywords



Overall, these keyword clusters provide nuanced insights into the diverse nature of research in digital marketing within the agricultural field. They highlight the integration of technology, the exploration of specific marketing strategies, and the interaction between traditional agricultural practices and contemporary digital marketing approaches. Researchers and practitioners in this field can leverage these insights to sharpen their focus, identify emerging trends, and advance collaboration in enhancing the integration of digital marketing and agriculture.

4. Conclusion

Research and digital marketing trends in agriculture have increased in the last 5 years, marked by an increase in the number of paper publications from 2019 to 2023. However, the increase is not very significant. Meanwhile, the highest number of publications were in China, which indicates that the trend of using digital marketing in agriculture in China is quite high.

China Agricultural University and Brawijaya University are ranked first with the highest number of publications, but the value is not too high, namely 2 documents or papers. Meanwhile, for "leading journals," there are no journals that meet the requirements or criteria for being a leading journal.

The authors with the highest number of publications were Cowan, T., and Johson, R., with a total of 3 publications. and for the highest keyword frequency with 627 keyword nodes, only 12 keywords meet the criteria with a keyword frequency of more than 5 times.

Researchers explore additional studies concerning digital marketing in agriculture, as outlined below:

1. Digital marketing research trends in agriculture have increased in the last 5 years. Despite this increase, the absolute value of publications is still relatively low, indicating potential research opportunities to deepen and broaden horizons. Future research could be directed at understanding the challenges that may limit the growth of publications in this domain.
2. Research opportunities can concentrate on further understanding effective digital marketing strategies in China's agricultural markets.
3. The absence of journals that meet the criteria as "leading journals" creates opportunities to improve the quality of publications. Further research can be conducted to understand journal assessment standards and apply them in order to improve the reputation of publications in this field.
4. Identifying researchers who have made major contributions, and frequently appearing keywords provide a foundation for in-depth research. Research opportunities may include further investigation into the methodologies used by leading researchers and the development of

keywords that may become a major focus in agricultural digital marketing.

5. With the growth of digital marketing, research opportunities may include developing models or algorithms that can increase marketing efficiency and effectiveness in the agricultural sector.
6. The involvement of universities in various countries, such as China Agricultural University and Brawijaya University, creates opportunities for international collaboration for knowledge exchange and innovative development.

5. Acknowledgment

Thank you for the committee to support the international conference agenda.

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