A Decade of Agricultural Research: Bibliometric Analysis of Malaysian Publications (2015-2024)

Authors:
Mohd Dasuki Sahak[1]*, Nur Azleen Hasan[2], Haziah Sa'ari, PhD[3]
[1], [2] Sultan Abdul Samad Library, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor Darul Ehsan
[3] School of Information Science, College of Computing, Informatics and Mathematics, Universiti Teknologi MARA Negeri Sembilan Rembau Campus, 71300 Rembau, Negeri Sembilan

Emails:
dasuki@upm.edu.my[1], azleen_h@upm.edu.my[2], haziah095@uitm.edu.my[3]

ABSTRACT: *This study presents a comprehensive bibliometric analysis of Malaysia's agricultural-related publications from the Scopus database, covering the years 2015 to 2024 and encompassing 29,086 documents. The analysis employed Scopus Analyze Search Results and Bibliometrix, an RStudio package, to ensure robust data analysis. 'Country affiliation' and 'Subject filters' were utilised to accurately represent Malaysia's Agricultural and Biological Sciences publications, acknowledging the related nature of these fields in the Scopus database. The study identifies publication types and examines annual scientific production, authorship patterns, citation metrics, subjects, topics, and the social structures of countries and institutions. The findings indicate a consistent annual growth in Malaysian agricultural research, which aligns with the Malaysia Plan initiative to enhance higher education and research institutions. Universiti Putra Malaysia (UPM) leads with 7,635 publications, followed by Universiti Kebangsaan Malaysia (3,065), Universiti Malaya (2,875), Universiti Sains Malaysia (2,752), and Universiti Malaysia Terengganu (2,289). Notably, two articles surpassed 1,000 citations: "Anthocyanidins and Anthocyanins: Colored Pigments as Food, Pharmaceutical Ingredients, and Their Potential Health Benefits" by Khoo et al. (2017) and "Overviews of Biological Importance of Quercetin: A Bioactive Flavonoid" by Anand David et al. (2016). This study underscores the significance of bibliometrics in evaluating research and publication activities, showcasing the proficiency of librarians in conducting bibliometric analyses using large datasets and RStudio. The findings of this study are significant to the field of agricultural and biological sciences, providing valuable insights into the trends and developments in Malaysian agricultural research.*

Keywords: *Bibliometric analysis, Agricultural research, Science mapping, Malaysia, Research trends*

1.0 INTRODUCTION

The National Bibliometric Study [2001-2017] conducted by the Ministry of Energy, Science, Technology, Environment, and Climate Change (MASTIC, 2022) reports that Malaysian researchers published 234,765 articles indexed in Scopus. In recent decades, bibliometrics has been actively used by governments and scientists as a standard tool for science policy and research management, driven by the increasing number of publications (Aria & Cuccurullo, 2017; Roy & Basak, 2013). The rise in publications reflects government initiatives under the Malaysia Plan to strengthen Malaysian higher education and research institutes (Ministry of Energy Science Technology Environment and Climate Change, 2022).

The National Bibliometric Study [2001-2017] identified 19,836 articles centred on Agricultural and Biological Sciences (MASTIC, 2022). These fields are grouped due to their interrelated nature. Agricultural research in Malaysia saw significant growth following the country's independence in 1957. It became firmly embedded in national development planning during the 5th Malaysia Plan (1986-1990) with the establishment of the National Council on Scientific Research and Development (Rahman, 2012). This growth trend in Malaysian agricultural research is a promising sign for the future of the field, indicating a continuous and robust development.

This study aims to provide a comprehensive bibliometric analysis of Malaysian agricultural-related publications from 2015 to 2024, focusing on literature in the agricultural and biological sciences field. While numerous global studies have explored bibliometrics in agriculture, concentrating on specific topics (Bhattacharjee et al., 2023; Coulibaly et al., 2022; Kiki et al., 2024; Latino et al., 2024; Moshahary et al., 2024; Rejeb et al., 2022; Sarkar et al., 2022; Slimani et al., 2024; Wu et al., 2023), there is a need for a detailed analysis focused on Malaysia. Previous studies dedicated to Malaysian agriculture bibliometric analysis (Hirawan et al., 2022; Islam et al., 2022; Jusoh et al., 2024; Padfield et al., 2019; Rejeb et al., 2022; Sudapet et al., 2022) have not comprehensively covered the recent decade's trends.

The objectives of this bibliometric analysis are to:

1. Determine the types of publications and annual scientific production.
2. Analyse authorship publications, including the most relevant authors, institutions, and country affiliations.
3. Identify the most cited documents, relevant subject matters, and topics
4. Explore the social structures of countries and institutions.

This bibliometric analysis provides an in-depth examination of Malaysian agricultural research from 2015 to 2024, leveraging the comprehensive Scopus database to offer robust insights. Focusing exclusively on this period and geographic region, the study aims to capture recent trends and developments reflecting Malaysia's current research landscape and policy initiatives. The 2015–2024 time frame aligned with the latest Malaysia Plan, which emphasises strengthening higher education and research institutions. This targeted approach enables a detailed understanding of publication trends, authorship, citation impact, and institutional collaboration within Malaysia, highlighting the country's significant contributions to agricultural science. The findings serve as a critical resource for policymakers, academic leaders, and researchers, providing valuable data to enhance Malaysia's scientific output and

international collaboration. This study underscores the vital role of bibliometrics in advancing research excellence and strategic planning in the agricultural sciences.

2.0 REVIEW OF SELECTED LITERATURE

Alan Pritchard (1969) introduced the term 'bibliometrics' to describe a new discipline that quantitatively analyses the scientific communication process through written documents. Since then, bibliometrics has been applied to various subject areas to analyse the growth of publications, and science mapping uses bibliometric methods to visualise the networking of disciplines, fields, specialities, and individual papers (Zupic & Čater, 2015). Given the scope and focus of this study, it is essential to review recent scholarly works that have employed bibliometric analysis in the context of Malaysian agriculture. This provides a foundation for understanding current trends and identifying gaps this study aims to address. Table 1 presents six examples of recent scholarly works focusing on bibliometric analysis of Malaysian agriculture. Data was sourced from Scopus, a bibliographic database, and extracted on June 24, 2024. Each study employs bibliometric analysis techniques to investigate trends, influences, and advancements. The studies cover various topics: aquaculture by Amusa et al. (2024), ecotourism by Ra et al. (2024a), rural landscape by Shaohua et al. (2024), technology by Abdul-Majid et al. (2024), wastewater treatment by Jusoh et al. (2024), and information technology and communication in agriculture research by Abdullahi et al. (2023).

These studies were selected for their relevance to the diverse aspects of agricultural research in Malaysia and their use of bibliometric methods to explore different subfields. They demonstrate the broad applicability of bibliometric analysis and provide context for understanding how this methodology can be used to analyse Malaysian agricultural research comprehensively. The findings from these studies help to highlight the advancements in specific areas of agriculture and point out the need for a more comprehensive, overarching analysis, which this study aims to provide.

Table 1: Recent Articles on Malaysian Agriculture Bibliometric Analysis

Authors	Title	DOI
Abdul-Majid et al. (2024)	Influence of technology adoption on farmers' well-being: Systematic literature review and bibliometric analysis	10.1016/j.heliyon.2024.e24316
Ra et al. (2024b)	Bibliometric Analysis on Ecotourism in Agriculture (2012 to 2022) Through VOSviewer	10.1051/bioconf/202410400008
Shaohua et al. (2024)	Multifunctional rural landscape: a systematic review and bibliometric perspective; [Paisagem rural multifuncional: uma revisão sistemática e perspectiva bibliométrica]	10.31413/nativa.v12i2.17021
Amusa et al. (2024)	Sustainable electricity generation and farm-grid utilisation from photovoltaic aquaculture: a bibliometric analysis from photovoltaic aquaculture: a bibliometric analysis	10.1007/s13762-024-05558-z

Jusoh et al. (2024)	Harvesting solutions: Discover the evolution of agriculture wastewater treatment through comprehensive bibliometric analysis using the Scopus database 1971-2023	10.1016/j.dwt.2024.100291
Abdullahi et al. (2023)	Mapping the Landscape of ICTs in Agriculture Research: A Bibliometric Analysis of Influential Publications and Authors	10.33168/JLISS.2023.0414

The selection of these articles serves multiple purposes. Firstly, they provide a snapshot of how bibliometric analysis has been applied to various facets of Malaysian agriculture, showcasing the diversity and depth of research in this field. Secondly, these studies highlight key trends, influential works, and emerging topics, offering a comparative framework against which this study's findings can be measured. Lastly, the reviewed literature underscores the need for a holistic approach that integrates these disparate strands into a unified analysis, addressing broader questions about the evolution and impact of agricultural research in Malaysia. By reviewing these recent works, it becomes evident that while significant progress has been made in specific areas of Malaysian agricultural research, there is a need for a comprehensive bibliometric analysis that encompasses the full spectrum of agricultural and biological sciences publications in Malaysia. This study aims to fill that gap by providing a holistic view of the trends, influences, and advancements in Malaysian agricultural research over the past decade.

This section contextualises the current study within the broader landscape of bibliometric research and justifies the need for a more inclusive analysis that captures the multifaceted nature of Malaysian agricultural research. By addressing this gap, the study seeks to contribute valuable insights to inform future research directions, policy-making, and strategic planning in the agricultural sector.

3.0 METHODOLOGY

3.1 Data Collection Method

To address the study objectives, data were collected from Scopus, a widely recognised and commonly used bibliographic database for bibliometric analysis (Aria & Cuccurullo, 2017; Fakruhayat & Rashid, 2023; Ra et al., 2024b; Thananusak, 2019). Scopus is preferred due to its comprehensive coverage and the inclusion of authors' data in cited references, which facilitates accurate author-based citation and co-citation analysis (Zupic & Čater, 2015). Utilising Scopus ensures a robust and reliable dataset, enhancing the validity of the analysis.

Following the PRISMA Statement as reporting guidance for systematic reviews (Page et al., 2021), the review adhered to a rigorous and well-defined methodology, encompassing the precise collection, selection, and analysis of relevant articles. This structured approach ensures transparency and replicability, which are crucial for the study's credibility. An extensive search was conducted in the Scopus database until July 21, 2024. The search strategy involved using the “Country Affiliation” filter with the keyword “Malaysia” and

limiting the results to the “Agricultural and Biological Sciences” subject. This initial search yielded 46,182 documents. In Scopus, documents on Biological Sciences are grouped with Agricultural Sciences because of their related nature, ensuring comprehensive coverage of relevant research.

The results were refined to focus on the last ten years, from 2015 to July 21, 2024, resulting in 29,086 documents for data analysis. The selection of this time frame is justified as it captures recent trends and developments, providing a current perspective on the research landscape. Limiting the data to this period also aligns with the objectives of identifying recent publication growth, topic trends, and research networking.

Analysing bibliometric data typically requires a large volume of bibliographic records to accurately identify trends and developments within the research topic, such as publication growth, topic trends, and networking (Fakruhayat & Rashid, 2023). Figure 1 provides a visual representation of the sequential steps employed in the search strategy, further emphasising the systematic and rigorous nature of the review process.

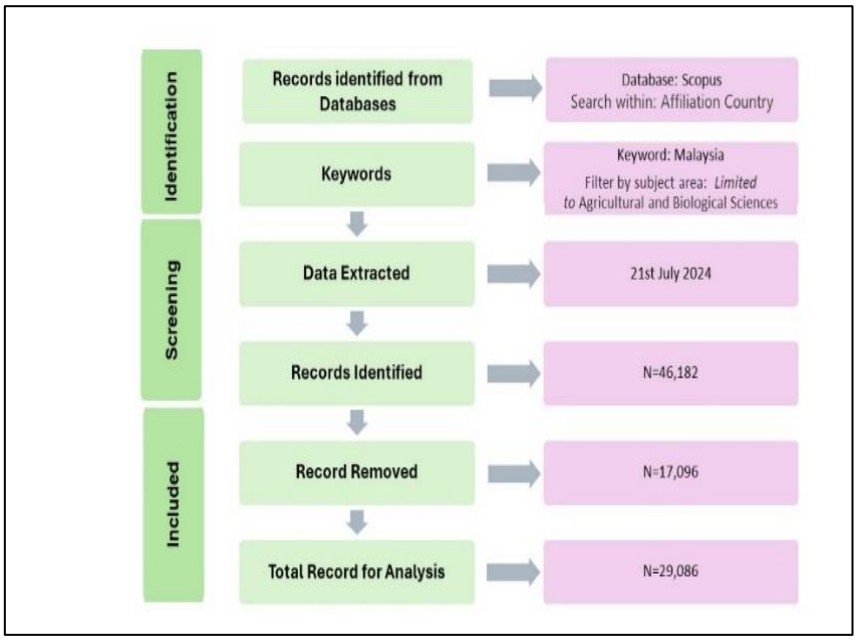


Figure 1: Sequential Steps Employed in the Search Strategy

3.2 Data Analysis

This study utilised the Analyze Search Results available in Scopus for descriptive data analysis of the entire dataset on Malaysian Agricultural and Biological Sciences from 2015 to 2024. Additionally, publication data from 2021 to 2023 were used as samples to identify the most recent relevant keywords and collaboration patterns among countries and institutions. This focused analysis helps capture the latest research dynamics and collaborative trends.

The data set samples were analysed using Biblioshiny, an R package specifically designed for bibliometric analysis, which has been validated by previous studies (Ali et al., 2022; Büyükkidik, 2022; Ejaz et al., 2022; Kumar et al., 2023; Shamsuddin et al., 2022; Waghmare,

2021). The use of Biblioshiny allows for comprehensive and sophisticated analysis, ensuring detailed insights into various aspects of the data.

The Biblioshiny analysis function produces outputs such as annual scientific production, the most productive authors, the most frequently used keywords, the most popular journals, and international collaborations, all related to the chosen research topic (Aria & Cuccurullo, 2017). This detailed analysis provides a thorough understanding of the research landscape and helps identify key trends and influential factors.

3.3 Study Limitations

This study is limited to "Malaysian Agricultural and Biological Sciences" from 2015 to 2024. Consequently, documents from other years and countries were excluded. This focus ensures a detailed and relevant analysis of the current state of agricultural research in Malaysia, but it also means that broader trends and historical data are not covered. Future studies could expand the scope to include other time periods and geographic regions to provide a more comprehensive view.

4.0 FINDINGS

4.1 Annual Scientific Production

Figure 2 below shows the production of Malaysian agriculture documents by year. The collection comprises 29,086 documents spanning the years 2015 to 2024. This finding shows the increasing number of publications in Malaysia's agricultural and biological sciences field, with an average of 3,314 per year from 2015 to 2023. The most productive year will be 2023 (3,769 documents), followed by 2022 (3,629 documents), 2021 (3,594 documents), and 2020 (3,161 documents). Meanwhile, for the recent year 2024, July 21, the number of publications also indicates a high number of publications with 1,964 documents and close to two thousand documents.

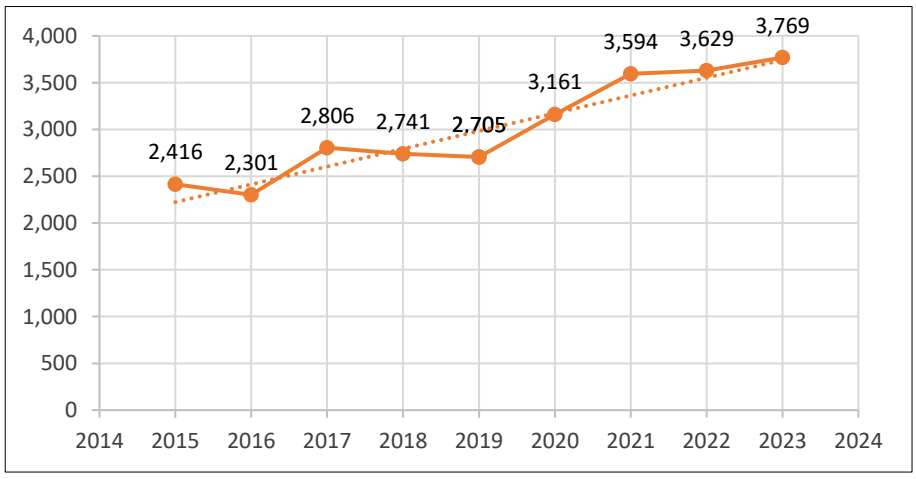


Figure 1: Annual Scientific Production

4.2 Types of Publications

Figure 3 below shows the types of Malaysian agriculture documents. The total number of documents is 29,086, with five document types. The most common types of publications are articles (24,045 documents), followed by reviews (2,479 documents), book chapters (1,348 documents), and conference papers (509 documents).

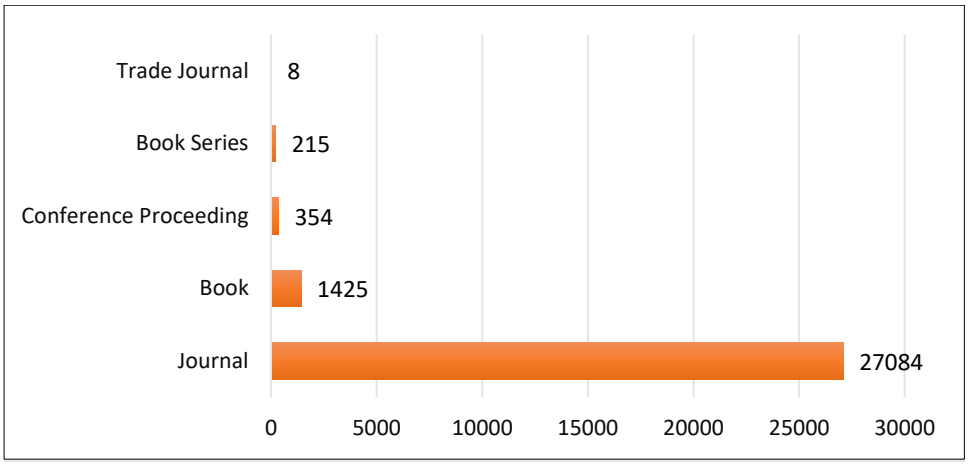


Figure 2: Types of Publications

4.3 Most Relevant Country Publications

Figure 4 presents the most country publications on Malaysia's Agricultural and Biological Sciences. Most of the publications come from Malaysia (29,086 documents), followed by the United States (1,890 documents), China (1,885 documents), and the United Kingdom (1,782 documents).

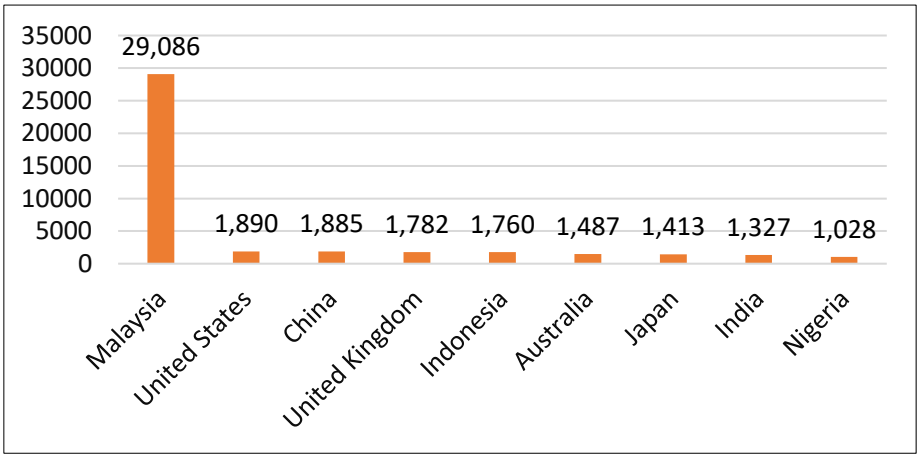


Figure 3: Most Country Publications

4.4 Most Relevant Affiliations

Figure 5 shows Malaysia's top 10 most significant Agricultural and Biological Sciences affiliations from 2015 to July 2024. Five universities have contributed over two thousand publications, with Universiti Putra Malaysia (UPM) leading with 7,635 documents. Following UPM are Universiti Kebangsaan Malaysia (3,065 documents), Universiti Malaya (2,875 documents), Universiti Sains Malaysia (2,752 documents), and Universiti Malaysia Terengganu (2,289 documents).

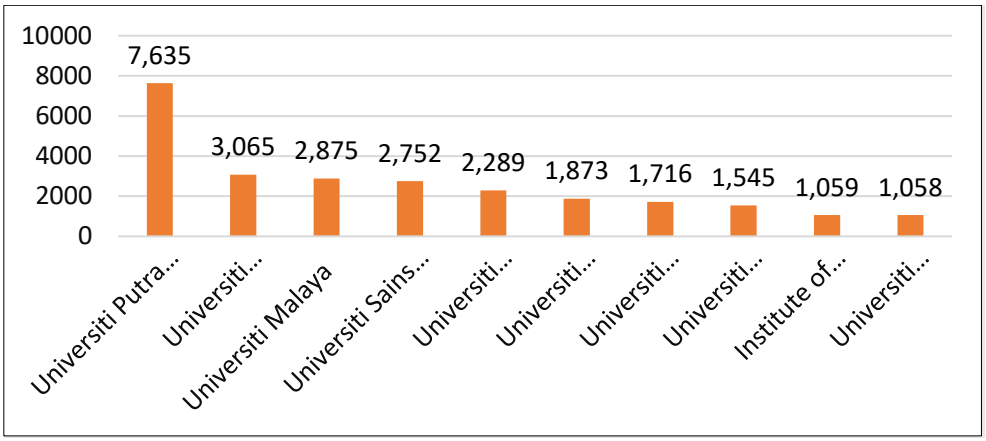


Figure 4: Most Relevant Affiliations

4.5 Most Relevant Authors

Table 2 lists the most relevant authors in Malaysia in agricultural and biological sciences. Among the 12 authors featured, eight are from Universiti Putra Malaysia (UPM). The author with the most publications is Tan, C.P. from UPM, with 215 documents. Following him are Ikhwanuddin, M. from Universiti Malaysia Terengganu, with 165 documents; Abas, F. from UPM, with 127 documents; Sazili, A.Q. from UPM, with 114 documents; Rafii, M.Y. from UPM, with 112 documents; and Yusoff, F.M. from UPM, with 101 documents.

Table 1: Most Relevant Authors

Authors	Institutions	Documents
Tan, C.P.	Universiti Putra Malaysia	215
Ikhwanuddin, M.	Universiti Malaysia Terengganu	165
Abas, F.	Universiti Putra Malaysia	127
Sazili, A.Q.	Universiti Putra Malaysia	114
Rafii, M.Y.	Universiti Putra Malaysia	112
Yusoff, F.M.	Universiti Putra Malaysia	101
Subramaniam, S.	Universiti Sains Malaysia	98
Huda, N.	Universiti Malaysia Sabah	93
Saari, N.	Universiti Putra Malaysia	93
Hashim, N.	Universiti Putra Malaysia	92
Yusof, Y.A.	Universiti Putra Malaysia	92

4.6 Most Cited Documents

Table 3 presents the most cited documents in Malaysia's Agricultural and Biological Sciences. Notably, two articles have surpassed one thousand citations: "Anthocyanidins and Anthocyanins: Colored Pigments as Food, Pharmaceutical Ingredients, and Their Potential Health Benefits" by Khoo et al. (2017) and "Overviews of Biological Importance of Quercetin: A Bioactive Flavonoid" by Anand David et al. (2016).

Table 2: Most Cited Documents

Authors (Year)	Title	Cited by	DOI
Khoo et al. (2017)	Anthocyanidins and anthocyanins: Colored pigments as food, pharmaceutical ingredients, and the potential health benefits	1,752	10.1080/16546628.2017.1361779
Anand David et al. (2016)	Overviews of biological importance of quercetin: A bioactive flavonoid	1,027	10.4103/0973-7847.194044
Watson et al. (2018)	Speed breeding is a powerful tool to accelerate crop research and breeding	697	10.1038/s41477-017-0083-8
Al-Mulali et al. (2015)	Investigating the environmental Kuznets curve (EKC) hypothesis by utilising the ecological footprint as an indicator of environmental degradation as an indicator of environmental degradation	581	10.1016/j.ecolind.2014.08.029
Koyande et al. (2019)	Microalgae: A potential alternative to health supplementation for humans	580	10.1016/j.fshw.2019.03.001
Wijayawardene et al. (2020)	Outline of Fungi and fungus-like taxa	575	10.5943/mycosphere/11/1/8
Sinclair et al. (2016)	Can we predict ectotherm responses to climate change using thermal performance curves and body temperatures?	575	10.1111/ele.12686
Alam et al. (2016)	Relationships among carbon emissions, economic growth, energy consumption and population growth: Testing Environmental Kuznets Curve hypothesis for Brazil, China, India and Indonesia	546	10.1016/j.ecolind.2016.06.043
Ossai et al. (2020)	Remediation of soil and water contaminated with petroleum hydrocarbon: A review	508	10.1016/j.eti.2019.100526
Mahmood et al. (2016)	Effects of pesticides on environment	507	10.1007/978-3-319-27455-3_13

4.7 Most Relevant Subject

Figure 6 presents the most relevant subjects, which the most appropriate will be “Agricultural and Biological Sciences” (29,086 documents), followed by “Environmental Science” (7,295 documents) and “Biochemistry, Genetics and Molecular Biology” (6,059 documents).

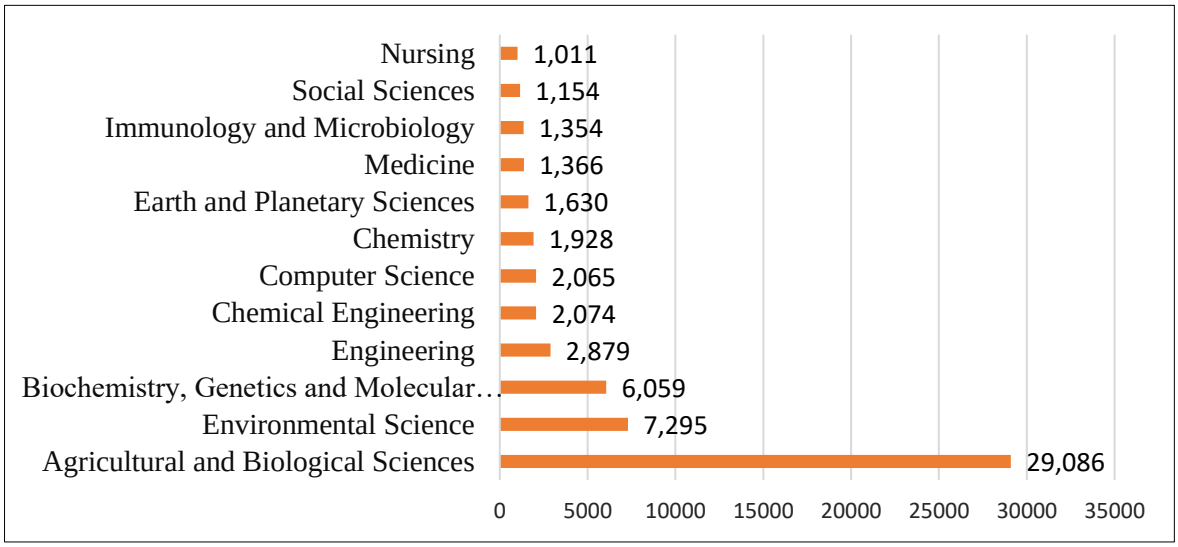


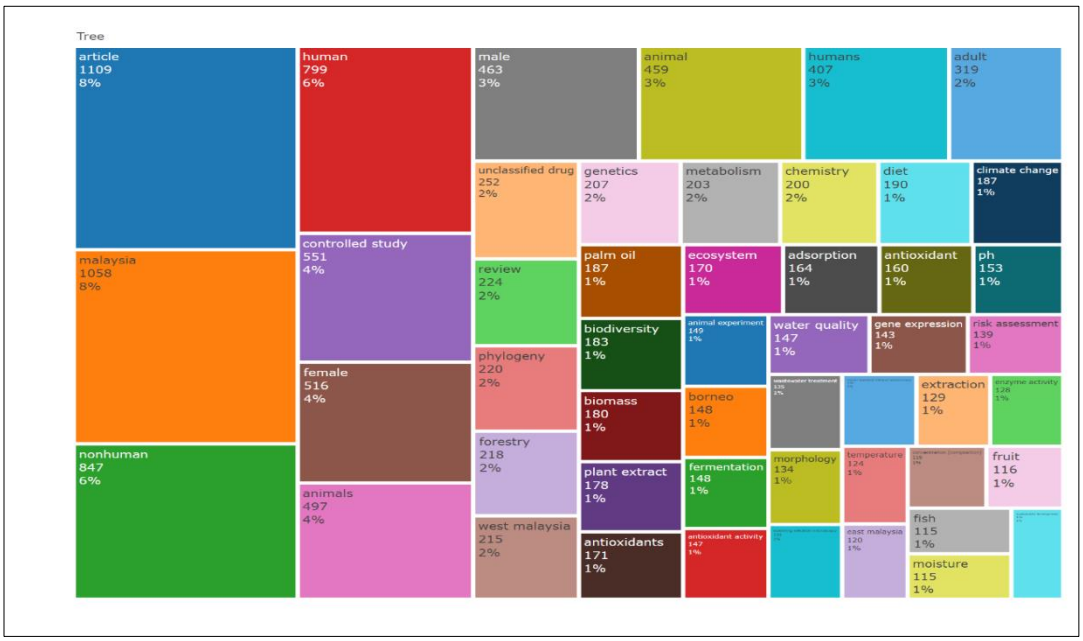
Figure 5: Most Relevant Subject

4.8 Most Relevant Keywords

Figure 7 shows the most relevant keywords based on data samples from 2021 to 2023. Scopus keywords plus categories were analysed by using Biblioshiny. The most terms will be “article” (1,109 frequency), then followed by “Malaysia” (1,058 frequency), “nonhuman” (847 frequency), “human” (799 frequency), “controlled study” (551 frequency), “female” (516

frequency), “animals” (497 frequency), “male” (463 frequency), “animal” (459 frequency), “humans” (407 frequency), and “adult” (319 frequency).

Figure 6: Most Relevant Keywords



4.9 Most Collaboration Country

Figure 8 and Table 4 present the most recent collaborative country on Malaysian agricultural and biological sciences using sample data from 2021 to 2023. Malaysia is the most collaborative country (cluster 7, 0.161 rank), followed by China (cluster 5, 0.046 rank), the United States (cluster 6, 0.046 rank), and the United Kingdom (cluster 6, 0.04 rank).

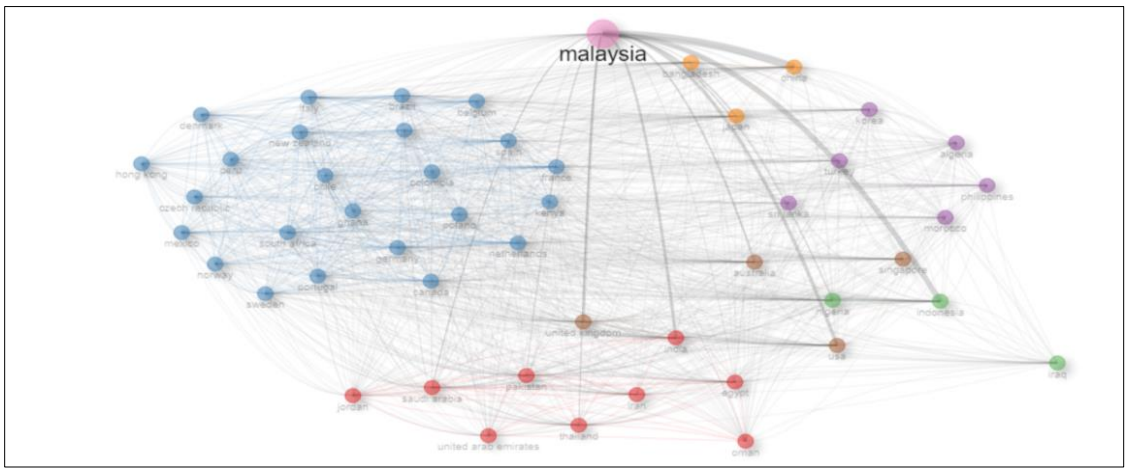


Figure 8: Most Collaborative Country

Table 4: Most Collaborative Country

Country	Cluster	Rank
Malaysia	7 (Pink)	0.161
China	5 (Yellow)	0.046
USA	6 (Brown)	0.046
United Kingdom	6 (Brown)	0.04
India	1 (Red)	0.037
Australia	6 (Brown)	0.035
Indonesia	3 (Green)	0.031
Japan	5 (Yellow)	0.025
Germany	2 (Blue)	0.024
Saudi Arabia	1 (Red)	0.023

4.10 Most Collaboration Institutions

Figure 9, along with Table 5, visualises institutions with the most collaborations based on sample data from 2021 to 2023. Table 5 presents the most collaboration institutions that will be ranked by bibliometrics analysis which Universiti Putra Malaysia (cluster 2, 0.12 rank), followed by Universiti Sains Malaysia (cluster 2, 0.077 rank), Universiti Malaysia Terengganu (cluster 2, 0.07 rank) and Universiti Kebangsaan Malaysia (cluster 2, 0.069 rank). The most collaboration institutions that will be ranked by bibliometrics analysis are Universiti Putra Malaysia (cluster 2, 0.12 rank), followed by Universiti Sains Malaysia (cluster 2, 0.077 rank), Universiti Malaysia Terengganu (cluster 2, 0.07 rank) and Universiti Kebangsaan Malaysia (cluster 2, 0.069 rank).

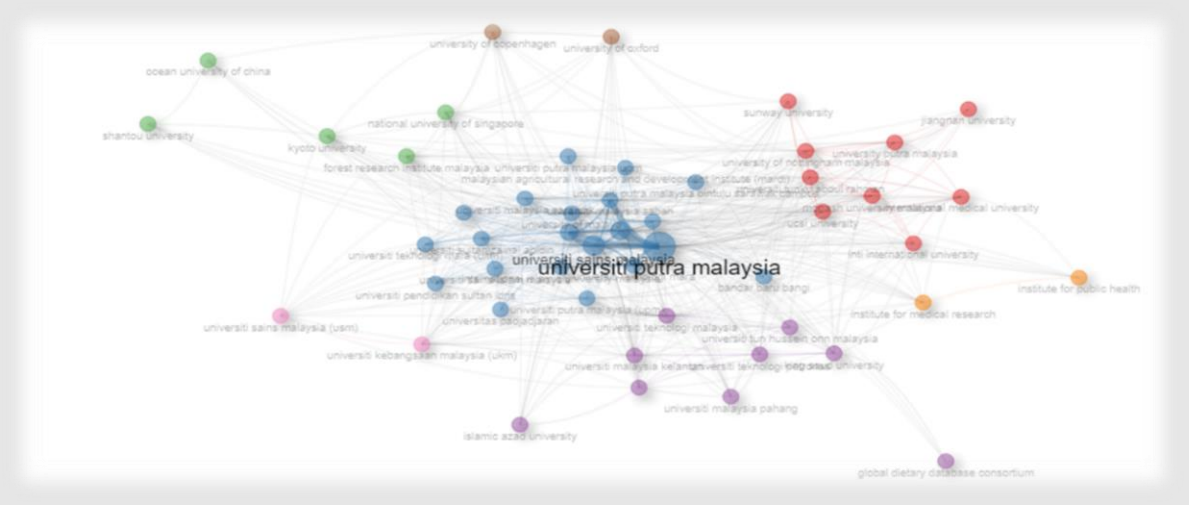


Figure 7: Most Collaboration Institutions

Table 3: Most Collaboration Institutions

Institutions	Cluster	Rank
Universiti Putra Malaysia	2	0.12
Universiti Sains Malaysia	2	0.077
Universiti Malaysia Terengganu	2	0.07
Universiti Kebangsaan Malaysia	2	0.069
Universiti Malaysia Sabah	2	0.049
Universiti Teknologi Mara	2	0.046
University of Malaya	2	0.034
Universiti Teknologi Malaysia	4	0.032
Universiti Malaya	2	0.03
Universiti Malaysia Kelantan	4	0.023

5.0 ANALYSIS: DISCUSSIONS AND SUGGESTIONS

5.1 Discussions

A comprehensive literature search of the Scopus database in June 2024 revealed that most previous bibliometric studies focused on specific topics within Malaysian agriculture. This study, however, provides a broader analysis of general issues in Malaysian agriculture to report on overall knowledge productivity. This approach is justified as it offers a holistic view, allowing for a more comprehensive understanding of the research landscape and identifying broader trends and gaps. Below is the discussion and analysis of research objectives with data findings.

The first objective was to analyse the main information from the data findings, including annual scientific production and types of publications. The results showed that the most productive year was 2023 (3,769 documents), followed by 2022 (3,629 documents), 2021 (3,594 documents), and 2020 (3,161 documents). The most common types of publications were articles (24,045 documents), followed by reviews (2,479 documents), book chapters (1,348 documents), and conference papers (509 documents). The annual rise in publications in Malaysian agricultural research aligns with the Malaysia Plan's initiative to strengthen higher education and research institutes (Ministry of Energy Science Technology Environment and Climate Change, 2022; Rahman, 2012). This trend reflects the increasing emphasis on research productivity and the growth of the academic community in Malaysia. The growing number of publications also aligns with global trends in agricultural research, driven by the need to address food security, sustainable farming practices, and climate change impacts (FAO, 2023). The selection of this period, 2015-2024, captures recent trends and developments, providing a current perspective on the research landscape.

The second objective was to analyse authorship publications, including the most relevant countries, institutions, and authors' affiliations. The analysis showed that the most relevant authors are from Universiti Putra Malaysia (UPM), which also has the most relevant affiliations. These results underscore UPM's prominent position in Malaysia's agricultural field. This dominance indicates UPM's robust research environment and its significant contribution to the country's agricultural research output. Additionally, international collaborations, particularly with China, the United States, and the United Kingdom, highlight Malaysia's integration into the global research community, fostering knowledge exchange and innovation. This is significant as it reflects Malaysia's active role in global agricultural research, contributing to and benefiting from international scientific advancements.

The third objective was to conduct a document analysis, identifying the most cited documents, relevant subject matters, and topics. The two most cited papers are "Anthocyanidins and Anthocyanins: Colored Pigments as Food, Pharmaceutical Ingredients, and Their Potential Health Benefits" by Khoo et al. (2017) and "Overviews of Biological Importance of Quercetin: A Bioactive Flavonoid" by Anand David et al. (2016), each with over 1,000 citations. Additionally, eight documents were cited more than 500 times. The most relevant subject is "Agricultural and Biological Sciences" (29,086 documents), followed by "Environmental Science" (7,295 documents) and "Biochemistry, Genetics and Molecular Biology" (6,059 documents). The most relevant keywords included "article" (1,109 frequency), "Malaysia" (1,058 frequency), "nonhuman" (847 frequency), and "human" (799 frequency). These findings highlight the significant impact of certain research topics and articles within the Malaysian agricultural research community, indicating areas of high interest and influence. The focus on topics such as environmental science and biochemistry underscores the interdisciplinary nature of modern agricultural research, which increasingly integrates ecological and molecular approaches to address complex agricultural challenges. This interdisciplinary focus is crucial for developing innovative solutions to global agricultural issues.

Additionally, the analysis identified key areas within Malaysian agriculture that are under-researched and require more focus. Sectors such as sustainable agriculture, precision farming, and the impact of climate change on local agriculture are critical for future research to ensure the adaptability and resilience of Malaysian agriculture. While there is significant research in broader agricultural and biological sciences, targeted studies in these emerging and crucial areas can provide actionable insights for policymakers and practitioners.

The fourth objective was to analyse the social structures of countries and institutions. Collaboration networks were used to assess collaboration among Malaysian scientists. The most collaborative country was Malaysia (cluster 7, 0.161 rank), followed by China (cluster 5, 0.046 rank), the United States (cluster 6, 0.046 rank), and the United Kingdom (cluster 6, 0.04 rank). These results demonstrate the active participation of Malaysian scientists in agricultural research and the growing interest from international collaborators. Universiti Putra Malaysia remains the leading institution in terms of collaboration (cluster 2, 0.12 rank), followed by Universiti Sains Malaysia (cluster 2, 0.077 rank), Universiti Malaysia Terengganu (cluster 2, 0.07 rank), and Universiti Kebangsaan Malaysia (cluster 2, 0.069 rank). These findings highlight the importance of institutional collaborations in driving research productivity and innovation in Malaysian agriculture. The integration of Malaysian research

within the global scientific community is essential for addressing transnational agricultural issues such as climate change, food security, and sustainable development. These collaborations are vital for sharing knowledge, resources, and methodologies that can enhance research quality and impact.

Given the strategic importance of agriculture in Malaysia's economic and social development, this study's findings are particularly relevant. The Malaysian government has prioritised agricultural research as a key component of its national development plans, recognising the sector's potential to enhance food security, create employment, and drive sustainable development. This study's insights into the productivity and collaborative nature of Malaysian agricultural research can inform policy decisions and help prioritise areas for investment and support.

Additionally, the alignment of this study with international initiatives, such as the United Nations' Sustainable Development Goals (SDGs), particularly Goal 2 (Zero Hunger) and Goal 13 (Climate Action), underscores its global relevance. The findings also resonate with the objectives of the International Federation of Library Associations and Institutions (IFLA), which advocates for access to information and knowledge sharing to support sustainable development and improve agricultural practices globally. The IFLA's emphasis on access to information supports disseminating and utilising agricultural research findings, furthering the impact of studies like this one.

5.2 Suggestions for Future Research and Policy

We suggest the following comprehensive recommendations, encompassing both policy and future research directions, to further enhance the impact and relevance of Malaysian agricultural research:

1. Focus on Under-Researched Areas: Future research should prioritise under-researched areas such as sustainable agriculture, precision farming, and the impacts of climate change on local agriculture. These areas are critical for ensuring the resilience and sustainability of Malaysian agriculture and for positioning Malaysia as a leader in innovative agricultural practices.
2. Enhance Interdisciplinary Research: Encouraging interdisciplinary research that integrates ecological, molecular, and technological approaches can lead to innovative solutions for complex agricultural challenges. This can include collaborations between agronomists, biotechnologists, environmental scientists, and data analysts to create comprehensive and cutting-edge research outcomes.
3. Strengthen International Collaborations: Building stronger international collaborations can enhance knowledge exchange and bring diverse perspectives to Malaysian agricultural research. This can be facilitated by joining research projects, exchange programs, and international conferences. Such collaborations will improve research quality and increase Malaysia's visibility and influence in the global agricultural research community.
4. Policy Support for Research Initiatives: Policymakers should support research initiatives that align with national development goals and international commitments,

such as the SDGs. This includes increasing funding for agricultural research, developing infrastructure to support innovative projects, and implementing training programs to equip researchers with the latest skills and knowledge.

5. Promote Open Access and Knowledge Sharing: Ensuring that research findings are accessible to a broader audience can enhance their impact. This includes publishing in open access journals, utilising platforms like IFLA for dissemination, and contributing to global databases such as AGRIS. Open access will facilitate wider dissemination and application of research findings, benefiting both the academic community and practitioners.
6. Invest in Agricultural Education and Training: Strengthening agricultural education and training programs can build a skilled workforce capable of advancing agricultural research and practices. This includes integrating modern technologies and methodologies into the curriculum, offering hands-on training opportunities, and fostering a culture of continuous learning among agricultural professionals.
    a. Syllabus for Librarians: It is essential to develop a specialised syllabus for academic librarians in agricultural institutions. This syllabus should cover areas such as digital repository management, agricultural databases, information retrieval, data management, research support services, data science, and big data management. Training should also include emerging technologies, data analysis tools, and open-access publishing platforms.
7. Leverage the Role of AGRIS: The Agricultural Information System (AGRIS) can play a pivotal role in improving the accessibility and visibility of Malaysian agricultural research. By actively contributing to AGRIS, Malaysian researchers can ensure their work reaches a global audience, facilitating wider dissemination and impact. This international exposure can attract more collaboration opportunities and increase the citation and utilisation of Malaysian research.
8. Empower Academic Librarians: Academic librarians, particularly in specialised agricultural institutions, can significantly enhance research productivity and dissemination. Their role in managing digital repositories, facilitating access to agricultural databases, and providing research support is crucial for advancing agricultural knowledge. Providing ongoing training and resources for librarians will enable them to support researchers more effectively and maximise their impact on the research community. This includes data science and big data management competencies, enabling librarians to handle large volumes of agricultural data to support and conduct related research.

This comprehensive bibliometric analysis provides critical insights into Malaysian agricultural research's productivity, impact, and collaborative nature. By situating the findings within the context of national initiatives and global trends, the study highlights the pivotal role of Malaysian research in contributing to global agricultural advancements. The emphasis on interdisciplinary research and international collaborations suggests a robust and dynamic research environment poised to address contemporary agricultural challenges. This study not only contributes to understanding the current state of agricultural research in Malaysia but also provides a foundation for future studies and policy-making aimed at enhancing research impact and collaboration.

Table 6: Key Findings and Suggestions in Malaysian Agricultural Research (2015-2024)

Aspect of Research	Key Findings	Suggestions
Annual Scientific Production	The most productive year is 2023 (3,769 documents), with an average of 3,314 per year.	✓ Maintain and increase publication rates through funding and support.
Types of Publications	Articles (24,045), Reviews (2,479), Book Chapters (1,348), Conference Papers (509).	✓ Encourage diverse publication types, especially reviews and conference papers for knowledge dissemination.
Top Institutions	Universiti Putra Malaysia (7,635 documents), Universiti Kebangsaan Malaysia (3,065), Universiti Malaya (2,875).	✓ Strengthen institutional research capacities and collaboration networks.
Top Authors	Tan, C.P. (215 documents), Ikhwanuddin, M. (165 documents), Abas, F. (127 documents).	✓ Recognize and support prolific researchers with funding and resources.
Most Cited Documents	Khoo et al. (2017) - 1,752 citations, Anand David et al. (2016) - 1,027 citations.	✓ Promote high-impact research and facilitate citation through open access.
Relevant Subjects	Agricultural and Biological Sciences (29,086 documents), Environmental Science (7,295), Biochemistry, Genetics and Molecular Biology (6,059).	✓ Focus on interdisciplinary research combining these subjects.
Top Keywords	Article, Malaysia, Nonhuman, Human, Controlled Study, Female, Animals, Male, Animal, Humans, Adult.	✓ Encourage research addressing key topics highlighted by keywords.
Top Collaborating Countries	Malaysia, China, United States, United Kingdom.	✓ Strengthen international collaborations through joint projects and exchanges.
Top Collaborating Institutions	Universiti Putra Malaysia, Universiti Sains Malaysia, Universiti Malaysia Terengganu, Universiti Kebangsaan Malaysia.	✓ Enhance institutional collaborations with targeted programs and initiatives.
Under-Researched Areas	Sustainable agriculture, precision farming, climate change impacts on local agriculture.	✓ Prioritize funding and research initiatives in these critical areas.

6.0 CONCLUSIONS

Is Malaysia Left Behind Compared to Other Countries in Agricultural Research?
No, Malaysia is not left behind in the field of agricultural research compared to other countries.

- ✓ Publication Volume and Impact: The study indicates that Malaysia produces a high volume of impactful agricultural research publications. Institutions like Universiti Putra Malaysia (UPM) are leading in this domain, contributing significantly to the global body of knowledge.
- ✓ International Collaborations: Malaysia has strong international collaborations with countries like China, the United States, and the United Kingdom. These collaborations enhance the quality and impact of Malaysian agricultural research, integrating it into the global research community.
- ✓ Alignment with Global Initiatives: Malaysian agricultural research aligns with global initiatives such as the United Nations' Sustainable Development Goals (SDGs). This alignment demonstrates Malaysia's commitment to addressing global agricultural challenges, positioning the country as a proactive player on the international stage.
- ✓ Focus on Emerging Areas: The study highlights Malaysia's focus on emerging and critical areas such as sustainable agriculture, precision farming, and climate change impacts. This focus ensures that Malaysian research remains relevant and forward-looking.
- ✓ Institutional Support: Organizations such as MARDI, IFLA, PPM, and UNESCO support and disseminate Malaysian agricultural research, providing the necessary infrastructure and platforms for global knowledge exchange.

While there are always areas for improvement and growth, Malaysia's contributions to agricultural research are significant and comparable to other countries. The country's proactive approach, strong institutional support, and international collaborations ensure it remains a vital player in the global agricultural research landscape.

This bibliometric study has significantly enriched the existing body of knowledge by identifying the publication productivity and impact through the types of publications, analyses of annual scientific production, authorship, document citations, subjects, topics, and social structures of countries and institutions. This study highlights the importance of the methodologies used, employing Scopus bibliographic data and Bibliometrix software to analyse research trends within large bibliometric datasets. Given the extensive dataset of over 29,000 entries used to determine total publications, future studies could narrow their focus to publications from the past decade to better capture current trends in Malaysian agriculture. Additionally, future research could explore other software tools for further bibliometric analysis. The global issue of sustainable agriculture and food security is becoming increasingly urgent due to climate change, population growth, and resource depletion. With its rich biodiversity and strategic location, Malaysia has significant potential to contribute to global agricultural solutions. The findings of this study indicate that Malaysian research institutions, particularly Universiti Putra Malaysia (UPM), are at the forefront of agricultural research, producing a high volume of impactful publications. UPM’s mission to advance knowledge and learning through quality research and education aligns with its leadership in this field, making it a key player in both national and international agricultural research

landscapes. The alignment of Malaysian agricultural research with global initiatives, such as the United Nations' Sustainable Development Goals (SDGs), particularly Goal 2 (Zero Hunger) and Goal 13 (Climate Action), underscores the international relevance of this work. The integration of interdisciplinary research approaches and strong international collaborations can position Malaysia as a key player in addressing global agricultural challenges.

Malaysian agricultural bodies, universities, and research institutions must continue to foster a collaborative environment that encourages innovation and knowledge exchange. Organisations such as the Malaysian Agricultural Research and Development Institute (MARDI), the International Federation of Library Associations and Institutions (IFLA), the Persatuan Pustakawan Malaysia (PPM), and UNESCO play crucial roles in supporting and disseminating agricultural research. These institutions can provide the necessary infrastructure, funding, and global platforms for sharing research findings. Universities are pivotal in driving agricultural research forward. By integrating advanced technologies and interdisciplinary methodologies, they can contribute to sustainable agricultural practices and policies. The collaboration between Malaysian universities and international research bodies will enhance the global impact of Malaysian agricultural research. In conclusion, this paper not only contributes to understanding the current state of agricultural research in Malaysia but also provides a foundation for future studies and policymaking aimed at enhancing research impact and collaboration. By aligning with global agricultural priorities and leveraging the strengths of local and international research institutions, Malaysia can play a significant role in addressing the pressing agricultural issues of our time.

ACKNOWLEDGEMENT

We thank Mr. Mahbob Yusof, Chief Librarian of Universiti Putra Malaysia (UPM), for the valuable discussion that led to this paper. This research would not have been possible without the financial support of Universiti Putra Malaysia (UPM). Special thanks to the Sultan Abdul Samad Library for providing access to state-of-the-art facilities and resources that played a crucial role in the execution of this research.

REFERENCES

Abdullahi, H. O., Mahmud, M., Hassan, A. A., & Ali, A. F. (2023). Mapping the Landscape of ICTs in Agriculture Research: A Bibliometric Analysis of Influential Publications and Authors. *Journal of Logistics, Informatics and Service Science*, *10*(4), 206–218. https://doi.org/10.33168/JLISS.2023.0414

Abdul-Majid, M., Zahari, S. A., Othman, N., & Nadzri, S. (2024). Influence of technology adoption on farmers' well-being: Systematic literature review and bibliometric analysis. *Heliyon*, *10*(2). https://doi.org/10.1016/j.heliyon.2024.e24316

Alam, M. M., Murad, M. W., Noman, A. H. M., & Ozturk, I. (2016). Relationships among carbon emissions, economic growth, energy consumption and population growth: Testing Environmental Kuznets Curve hypothesis for Brazil, China, India and Indonesia. *Ecological Indicators*, *70*, 466–479. https://doi.org/10.1016/j.ecolind.2016.06.043

Alan Pritchard. (1969). Statistical Bibliography or Bibliometrics? In *Journal of Documentation* (Vol. 25, Issue 4).

Ali, J., Jusoh, A., Idris, N., Airij, A. G., & Chandio, R. (2022). Wearable Devices in Healthcare Services. Bibliometrix Analysis by using R Package. *International Journal of Online and Biomedical Engineering*, *18*(8), 61–86. https://doi.org/10.3991/ijoe.v18i08.31785

Al-Mulali, U., Weng-Wai, C., Sheau-Ting, L., & Mohammed, A. H. (2015). Investigating the environmental Kuznets curve (EKC) hypothesis by utilising the ecological footprint as an indicator of environmental degradation. *Ecological Indicators*, *48*, 315–323. https://doi.org/10.1016/j.ecolind.2014.08.029

Amusa, A. A., Johari, A., Jalil, A. A., Abdullah, T. A. T., Adeleke, A. O., Katibi, K. K., Shitu, I. G., & Alhassan, M. (2024). Sustainable electricity generation and farm-grid utilisation from photovoltaic aquaculture: a bibliometric analysis. *International Journal of Environmental Science and Technology*, *21*(11), 7797–7818. https://doi.org/10.1007/s13762-024-05558-z

Anand David, A. V., Arulmoli, R., & Parasuraman, S. (2016). Overviews of biological importance of quercetin: A bioactive flavonoid. In *Pharmacognosy Reviews* (Vol. 10, Issue 20). https://doi.org/10.4103/0973-7847.194044

Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, *11*(4). https://doi.org/10.1016/j.joi.2017.08.007

Bhattacharjee, S., Panja, A., Panda, M., Dutta, S., Dutta, S., Kumar, R., Kumar, D., Yadav, M. R., Minkina, T., Kalinitchenko, V. P., Singh, R. K., & Rajput, V. D. (2023). How Did Research on Conservation Agriculture Evolve Over the Years? A Bibliometric Analysis. *Sustainability (Switzerland)*, *15*(3). https://doi.org/10.3390/su15032040

Büyükkidik, S. (2022). A Bibliometric Analysis: A Tutorial for the Bibliometrix Package in R Using IRT Literature. *Journal of Measurement and Evaluation in Education and Psychology*, *13*(3), 164–193. https://doi.org/10.21031/EPOD.1069307

Coulibaly, S., Kamsu-Foguem, B., Kamissoko, D., & Traore, D. (2022). Deep learning for precision agriculture: A bibliometric analysis. In *Intelligent Systems with Applications* (Vol. 16). https://doi.org/10.1016/j.iswa.2022.200102

Ejaz, H., Zeeshan, H. M., Ahmad, F., Bukhari, S. N. A., Anwar, N., Alanazi, A., Sadiq, A., Junaid, K., Atif, M., Abosalif, K. O. A., Hamza, M. A., & Younas, S. (2022). Bibliometric Analysis of Publications on the Omicron Variant from 2020 to 2022 in the Scopus Database Using R and VOSviewer. *International Journal of Environmental Research and Public Health*, *19*(19). https://doi.org/10.3390/ijerph191912407

Fakruhayat, M., & Rashid, A. (2023). How to Conduct a Bibliometric Analysis using R Packages: A Comprehensive Guidelines. In *Journal of Tourism, Hospitality & Culinary Arts* (Vol. 15, Issue 1).

Hirawan, D., Oktafiani, D., Fauzan, T. A., Luckyardi, S., & Jamil, N. (2022). Research Trends in Farming System Soil Chemical: A Bibliometric Analysis using VOSviewer. *Moroccan Journal of Chemistry*, *10*(3), 576–590. https://doi.org/10.48317/IMIST.PRSM/morjchem-v10i3.33145

Islam, M. M., Chowdhury, M. A. M., Begum, R. A., & Amir, A. A. (2022). A bibliometric analysis on the research trends of climate change effects on economic vulnerability. *Environmental Science and Pollution Research*, *29*(39), 59300–59315. https://doi.org/10.1007/s11356-022-20028-0

Jusoh, H. H. W., Juahir, H., Hanapi, N. H. M., Afandi, N. Z. M., Nasir, N. M., Kurniawan, S. B., Zakaria, N., & Nor, S. M. M. (2024). Harvesting solutions: Discover the evolution of agriculture wastewater treatment through comprehensive bibliometric analysis using the Scopus database 1971-2023. *Desalination and Water Treatment*, *317*. https://doi.org/10.1016/j.dwt.2024.100291

Khoo, H. E., Azlan, A., Tang, S. T., & Lim, S. M. (2017). Anthocyanidins and anthocyanins: Colored pigments as food, pharmaceutical ingredients, and the potential health benefits. In *Food and Nutrition Research* (Vol. 61). https://doi.org/10.1080/16546628.2017.1361779

Kiki, M. P. A. F., Ahouandjinou, S. A. R. M., Assogba, K. M., & Sutikno, T. (2024). Bibliometric analysis and survey on electronic nose used in agriculture. *International Journal of Electrical and Computer Engineering*, *14*(2). https://doi.org/10.11591/ijece.v14i2.pp1369-1381

Koyande, A. K., Chew, K. W., Rambabu, K., Tao, Y., Chu, D.-T., & Show, P.-L. (2019). Microalgae: A potential alternative to health supplementation for humans. *Food Science and Human Wellness*, *8*(1), 16–24. https://doi.org/10.1016/j.fshw.2019.03.001

Kumar, D., Shandilya, A. K., & Choudhuri, S. (2023). Artificial Intelligence-Enabled Bibliometric Analysis in Tourism and Hospitality Using Biblioshiny and VOSviewer Software. In *AI-Centric Modeling and Analytics: Concepts, Technologies, and Applications*. https://doi.org/10.1201/9781003400110-15

Latino, M. E., Menegoli, M., & Corallo, A. (2024). Agriculture Digitalization: A Global Examination Based on Bibliometric Analysis. *IEEE Transactions on Engineering Management*, *71*. https://doi.org/10.1109/TEM.2022.3154841

Mahmood, I., Imadi, S. R., Shazadi, K., Gul, A., & Hakeem, K. R. (2016). Effects of pesticides on the environment. In *Plant, Soil and Microbes: Volume 1: Implications in Crop Science*. https://doi.org/10.1007/978-3-319-27455-3_13

Ministry of Energy Science Technology Environment and Climate Change. (2022). *National Bibliometric Study [2001-2017]*. https://mastic.mosti.gov.my/sti-survey-content-spds/national-bibliometric-study-2001-2017

Moshahary, J., Choudhury, M., Ahmed, P., Sarma, B., Nath, R., & Saha, S. (2024). A bibliometric analysis of biochar in sustainable agriculture. *International Journal of Research in Agronomy*, *7*(1S). https://doi.org/10.33545/2618060x.2024.v7.i1sc.255

Ossai, I. C., Ahmed, A., Hassan, A., & Hamid, F. S. (2020). Remediation of soil and water contaminated with petroleum hydrocarbon: A review. *Environmental Technology and Innovation*, *17*. https://doi.org/10.1016/j.eti.2019.100526

Padfield, R., Hansen, S., Davies, Z. G., Ehrensperger, A., Slade, E. M., Evers, S., Papargyropoulou, E., Bessou, C., Abdullah, N., Page, S., Bicknell, J. E., & Struebig, M. J. (2019). Co-producing a Research Agenda for Sustainable Palm Oil. *Frontiers in Forests and Global Change*, *2*. https://doi.org/10.3389/ffgc.2019.00013

Page, M. J., Mckenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., Mcdonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. *International Journal of Surgery*, *88*.

Ra, D. S., Zalizar, L., Triwanto, J., Ervayenri, E., Mel, M., Iswahyudi, I., & Ekalaturrahmah, Y. A. C. (2024a). Bibliometric Analysis on Ecotourism in Agriculture (2012 to 2022) Through VOSviewer. *BIO Web of Conferences*, *104*. https://doi.org/10.1051/bioconf/202410400008

Ra, D. S., Zalizar, L., Triwanto, J., Ervayenri, E., Mel, M., Iswahyudi, I., & Ekalaturrahmah, Y. A. C. (2024b). Bibliometric Analysis on Ecotourism in Agriculture (2012 to 2022) Through VOSviewer. *BIO Web of Conferences*, *104*. https://doi.org/10.1051/bioconf/202410400008

Rahman, Z. A. (2012). Agricultural research and development in Malaysia. *Journal of the International Society for Southeast Asian Agricultural Sciences*, *18*(2).

Rejeb, A., Abdollahi, A., Rejeb, K., & Treiblmaier, H. (2022). Drones in agriculture: A review and bibliometric analysis. In *Computers and Electronics in Agriculture* (Vol. 198). https://doi.org/10.1016/j.compag.2022.107017

Roy, S. B., & Basak, M. (2013). Journal of documentation: A bibliometric study. *Library Philosophy and Practice*, *2013*.

Sarkar, A., Wang, H., Rahman, A., Memon, W. H., & Qian, L. (2022). A bibliometric analysis of sustainable agriculture: based on the Web of Science (WOS) platform. In *Environmental Science and Pollution Research* (Vol. 29, Issue 26). https://doi.org/10.1007/s11356-022-19632-x

Shamsuddin, S. N., Ismail, N., & Roslan, N. F. (2022). A bibliometric analysis of insurance literacy using bibliometrix and an R package. *AIP Conference Proceedings*, *2472*. https://doi.org/10.1063/5.0092721

Shaohua, L., Mohd Ali, N. A. B., & Muthuveeran, A. A. B. S. (2024). Multifunctional rural landscape: a systematic review and bibliometric perspective | Paisagem rural multifuncional: uma revisão sistemática e perspectiva bibliométrica. *Nativa*, *12*(2), 195–204. https://doi.org/10.31413/nativa.v12i2.17021

Sinclair, B. J., Marshall, K. E., Sewell, M. A., Levesque, D. L., Willett, C. S., Slotsbo, S., Dong, Y., Harley, C. D. G., Marshall, D. J., Helmuth, B. S., Helmuth, B. S., & Huey, R. B. (2016). Can we predict ectotherm responses to climate change using thermal performance curves and body temperatures? *Ecology Letters*, *19*(11), 1372–1385. https://doi.org/10.1111/ele.12686

Slimani, H., El Mhamdi, J., & Jilbab, A. (2024). Assessing the advancement of artificial intelligence and drones' integration in agriculture through a bibliometric study. *International Journal of Electrical and Computer Engineering*, *14*(1). https://doi.org/10.11591/ijece.v14i1.pp878-890

Sudapet, N., Setiawan, M. I., Muchayan, A., Sukoco, A., Sutowijoyo, H., & Zulkifli, C. Z. (2022). The Economic of Farmers, System, Management, and Technology Renewable Energy Based. *AgBioForum*, *24*(1), 170–177.

Thananusak, T. (2019). Science mapping of the knowledge base on sustainable entrepreneurship, 1996-2019. In *Sustainability (Switzerland)* (Vol. 11, Issue 13). https://doi.org/10.3390/su11133565

Waghmare, P. (2021). Bibliometric Analysis of Global Research Trends on E-Waste Management from Scopus Database seen through Biblioshiny. *Library Philosophy and Practice*, *2021*, 1–16.

Watson, A., Ghosh, S., Williams, M. J., Cuddy, W. S., Simmonds, J., Rey, M.-D., Asyraf Md Hatta, M., Hinchliffe, A., Steed, A., Reynolds, D., Wulff, B. B. H., & Hickey, L. T. (2018). Speed breeding is a powerful tool to accelerate crop research and breeding. *Nature Plants*, *4*(1), 23–29. https://doi.org/10.1038/s41477-017-0083-8

Wijayawardene, N. N., Hyde, K. D., Al-Ani, L. K. T., Tedersoo, L., Haelewaters, D., Rajeshkumar, K. C., Zhao, R. L., Aptroot, A., Leontyev, D. V., Saxena, R. K., Grossart, H. P., & Thines, M. (2020). Outline of Fungi and fungus-like taxa. *Mycosphere*, *11*(1), 1060–1456. https://doi.org/10.5943/mycosphere/11/1/8

Wu, Y., Meng, S., Liu, C., Gao, W., & Liang, X. Z. (2023). A bibliometric analysis of research for climate impact on agriculture. In *Frontiers in Sustainable Food Systems* (Vol. 7). https://doi.org/10.3389/fsufs.2023.1191305

Zupic, I., & Čater, T. (2015). Bibliometric Methods in Management and Organisation. Organisational *Research Methods*, *18*(3), 429–472. https://doi.org/10.1177/1094428114562629