

# Trends and Influential Works in Sustainable Crop Management: A Bibliometric Study

Pieter J. Kunu<sup>1</sup>, Roosganda Elizabeth<sup>2</sup>, Kuswarini Sulandjari<sup>3</sup>, Arief Yanto Rukmana<sup>4</sup>

<sup>1</sup> Fakultas Pertanian Universitas Pattimura and [pieterkunu@gmail.com](mailto:pieterkunu@gmail.com)

<sup>2</sup> BRIN; UNPAK-Bogor and [roosimanru@yahoo.com](mailto:roosimanru@yahoo.com)

<sup>3</sup> Prodi Agribisnis Fakultas Pertanian Universitas Singaperbangsa Karawang and  
[kuswarini.sulandjari@staff.unsika.ac.id](mailto:kuswarini.sulandjari@staff.unsika.ac.id)

<sup>4</sup> Universitas Pendidikan Indonesia and [ariefyantorukmana@upi.edu](mailto:ariefyantorukmana@upi.edu)

---

## ABSTRACT

This bibliometric study examines how the field of sustainable crop management research is developing through an analysis of publications and their citations. We use VOSviewer software and sophisticated bibliometric approaches to find emergent research subjects, co-authorship networks, trends, and influential publications. Our data shows a significant increase in research publications over the course of four decades, which is indicative of the growing understanding of the significance of sustainable agriculture. Key publications by well-known writers offer fundamental information, and co-authorship networks emphasize cooperative research initiatives. Agroecology and climate-resilient agriculture are two emerging study subjects that provide insights into the field's future orientations. Through an awareness of these trends and key publications, this research helps to support well-informed decisions about food security and sustainable agriculture.

*Keywords:* Sustainable, Crop, Management, Bibliometric Analys

---

## 1. INTRODUCTION

In an era characterized by increasing concerns for global food security and environmental sustainability, the search for effective and sustainable crop management practices has never been more important. The world population is expected to reach 9.7 billion by 2050, requiring a substantial increase in food production. At the same time, the adverse impacts of traditional agriculture, such as soil degradation, water depletion and greenhouse gas emissions, underscore the urgency of shifting to more sustainable practices [1]–[6].

Sustainable crop management encompasses various aspects, including pest control, soil health, and water conservation. Understanding the relationship between these factors and crop yield is essential for informed decision-making and promoting sustainable agricultural practices. Some studies have investigated the relationship between different factors and crop yield. A study found that yields of maize and wheat are generally higher with increased soil organic carbon (SOC) concentrations. However, yield increases level off at around 2% SOC. Approximately two-thirds of the world's cultivated maize and wheat lands currently have SOC contents of less than 2% [7].

A study on oil palm plantations in Sabah, Malaysian Borneo, found that the extent of forest cover and proximity to dipterocarp forest were not significant predictors of oil palm yield. Instead, lower elevation and closer proximity to forestry plantations had significant positive impacts on oil palm yield [8]. A study on crop residue burning in India found that financial viability and crop residue have bidirectional causality. Both central and state governments must provide financial solutions to encourage farmers to adopt residue management practices [9]. A methodological framework called RAD has been developed to understand the relationship between cropping system performance and farmers' practices. This framework has led to advances in assessing the effects of various factors on crop quality and environmental impact [10].

These studies highlight the importance of understanding the relationships between various factors in sustainable crop management. Further research is needed to fill information gaps and develop a comprehensive understanding of these relationships to promote sustainable agricultural practices.

This study embarks on a bibliometric journey to explore and analyze trends and influential works in sustainable crop management. Bibliometrics, an established methodology within the field of scientometrics, offers a powerful lens to examine scientific publications, citations and authorship patterns. By measuring the impact of research outcomes and identifying influential contributions, this study aims to provide valuable insights into the evolving landscape of sustainable crop management.

## 2. LITERATURE REVIEW

### 2.1 *Conscious Crop Management*

Given the twin difficulties of feeding a growing population and reducing the environmental impact of agriculture, sustainable crop management is an urgent global priority [11]–[14]. Although they have contributed significantly to the rise in food production over the past century, traditional agricultural methods have frequently come at a great environmental cost. Concerns about soil erosion, biodiversity loss, and overuse of synthetic chemicals and water have brought major doubts about the sustainability of these techniques in the long run [15]–[17].

A reaction to these difficulties was the development of the idea of sustainable crop management. Maximizing agricultural yields while reducing detrimental effects on the environment, society, and economy is the goal of sustainable agriculture. Organic farming, conservation agriculture, integrated pest control, and precision agriculture are just a few of the many techniques that fall under this umbrella. The goal of the field's practitioners and academics is to reconcile environmental care with agricultural output [18]–[22].

### 2.2 *Research on Sustainable Crop Management Is Changing*

As the necessity of sustainable crop management has become more widely recognized, so has the body of literature on the subject. Academics from many fields such as ecology, economics, agronomy, and environmental science have made contributions to this developing topic [1]–[3], [5], [23]. Understanding the development of research in this field is crucial to comprehending the trends and seminal works in sustainable crop management.

The majority of early studies on sustainable crop management concentrated on specific techniques and how they affected crop yields and environmental effects. Studies have looked into the advantages of using organic fertilizers, cover crops, and decreased tillage, for instance [6], [24]–[26]. Even though this research offered insightful information, they frequently lacked a thorough understanding of the area.

Sustainable crop management has seen a movement in recent years toward more comprehensive and multidisciplinary approaches. The intricate relationships among agronomic practices, ecological services, and socioeconomic issues are being studied by researchers more and more. This more comprehensive viewpoint acknowledges that resilient and adaptable agricultural systems are just as important to sustainable crop management as the adoption of particular practices [27]–[29].

### 3. METHODS

This study is a bibliometric analysis, a quantitative method used to evaluate the characteristics of academic literature, including publication trends, citation patterns, and authorship networks. We collected data from leading academic databases, including Web of Science and Scopus, to ensure comprehensive coverage of publications in the field of sustainable crop management. These databases are known for their extensive coverage of scientific literature and citation records with the help of Publish or Perish (PoP) software accessed on September 4, 2023.

**Table 1.** Research Data Metrics

Publication years	: 1947-2023
Citation years	: 76 (1947-2023)
Paper	: 980
Citations	: 387184
Cites/year	: 5094.53
Cites/paper	: 395.09
Cites/author	: 213670.68
Papers/author	: 502.94
Author/paper	: 2.82
h-index	: 250
g-index	: 622
hI,norm	: 215
hI,annual	: 2.83
hA-index	: 102
Papers with ACC	: 1,2,5,10,10:635,550,447,355,281

Source: Publish or Perish (2023)

#### 3.1 Data Analysis with VOSviewer

VOSviewer is a widely known bibliometric software tool used to visualize and analyze large datasets of scientific publications. It offers powerful capabilities to build co-authorship networks, analyze citation patterns, and identify clusters of related research topics. Here, we outline how VOSviewer was used in our study:

VOSviewer allowed us to visualize publication trends in sustainable crop management over time, highlighting periods of increased research activity and shifts in focus. We examined citation patterns to identify the most cited publications, authors and journals, indicating influential works and sources of inspiration in the field. VOSviewer allowed us to build a co-authorship network, which revealed patterns of collaboration among researchers. This provides insight into collaborative research groups and influential research groups. To understand emerging research themes, VOSviewer facilitates keyword co-occurrence analysis. This method identifies keywords that frequently co-occur in publications, indicating areas of interest and specialization in sustainable crop management.

### 4. RESULTS AND DISCUSSION

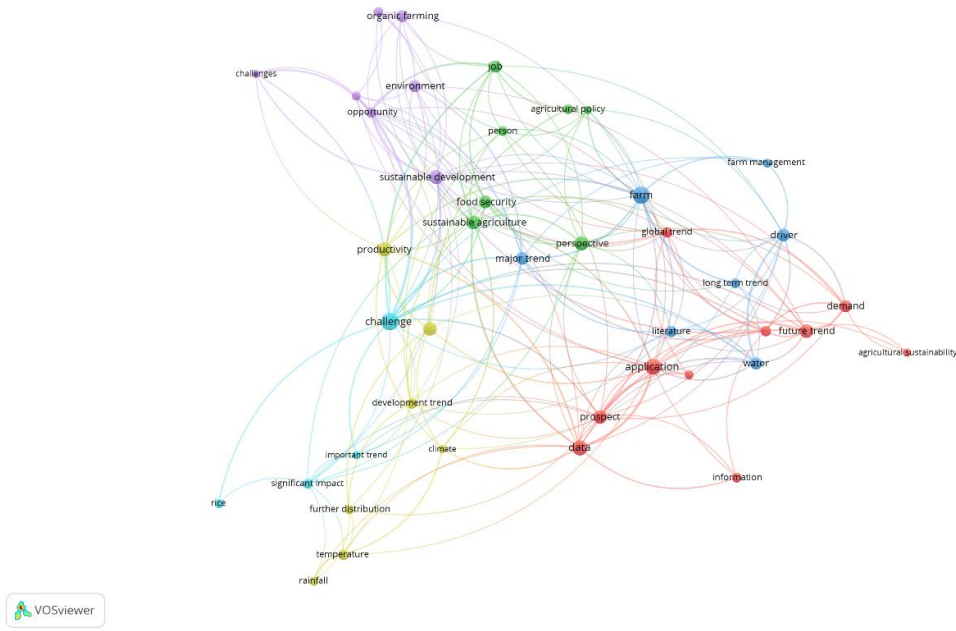


Figure 1. Mapping Results by Vosviewers (2023)

Our analysis shows a significant growth in research publications related to sustainable crop management over the past four decades. This growth indicates increasing recognition of the importance of sustainable agricultural practices. Figure 1 illustrates the themes of research in this area.

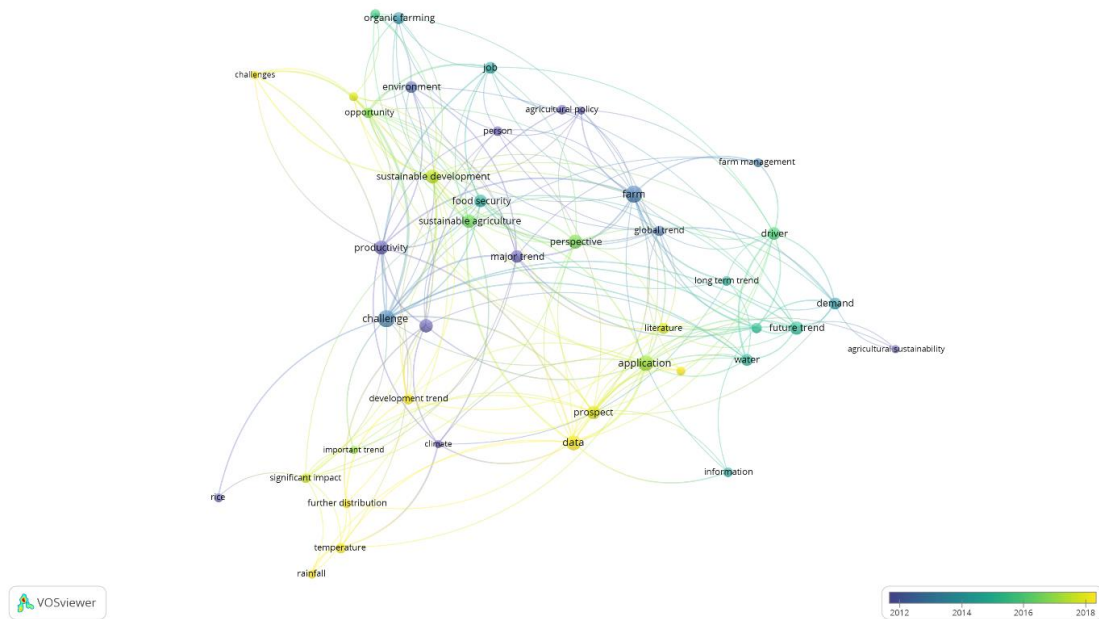


Figure 2. Research Trend by Vosviewers (2023)

As shown in Figure 2, there has been a gradual increase in publications since the early 1980s, with an even greater surge in the 2000s. This increase reflects the growing awareness of the need for sustainable crop management practices. The observed trends are aligned with global efforts to address environmental challenges and improve food security through sustainable agriculture.

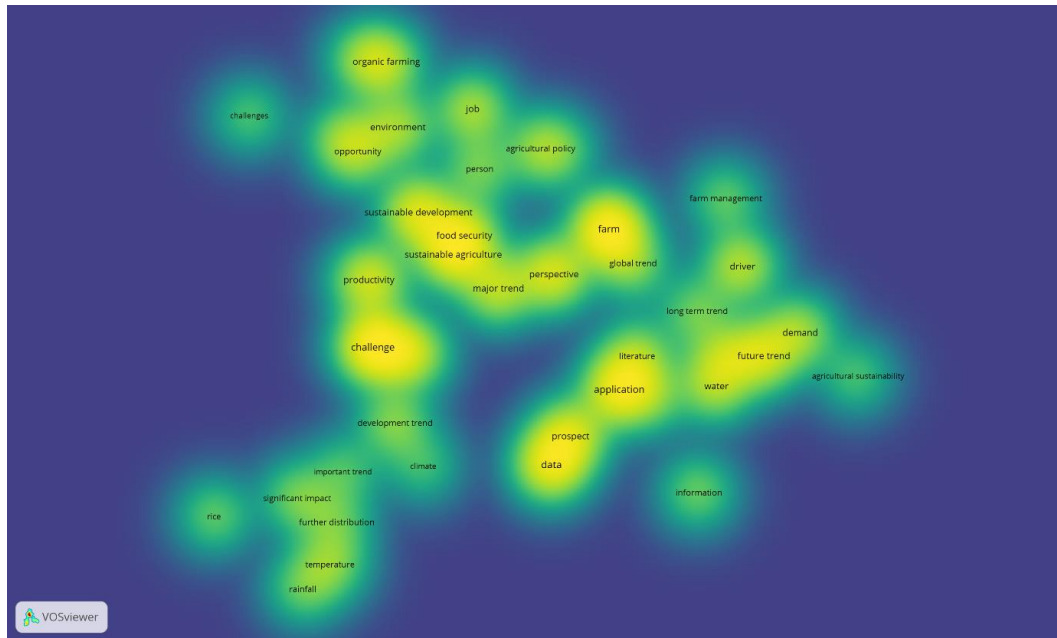


Figure 3. Cluster Identity by Vosviewers (2023)

Within sustainable agricultural management, the clusters in your bibliometric study reflect different themes and areas of research. These clusters provide insightful information on the wide range of themes and patterns investigated by scholars in the subject, from environmental sustainability and climate-related issues to agricultural product trends and policy considerations. Comprehending these clusters can aid in directing future studies and policy development related to sustainable agricultural practices.

Table 2. Cluster Identity

Cluster	Total Items	Most frequent keywords (occurrences)	Keyword
1	10	Agricultural product (30), demand (15), global trend (30), personal relationship (20), prospect (30)	Agricultural product, agricultural sustainability, application, data, demand, future trend, global trend, information, personal relationship, prospect
2	7	Agricultural policy (30), food security (25), sustainable agriculture (15)	Agricultural policy, food security, general trend, job, person, perspective, sustainable agriculture

3	7	Farm management (20), water (15)	Driver, farm, farm management, literature, long term trend, major trend, water
4	7	Climate (20), productivity (25)	Climate, development trend, efficiency, further distribution, productivity, rainfall, temperatur
5	7	Environment (25), organic (20),	Challenges, environment, opportunity, organic farming, soil, sustainable agricultural, sustainable development
6	4	Importand trend (25)	Challenge, important trend, rice, significant impact

Source: Data Processing Results (2023)

Based on table 2 cluster 1 consists of 10 items and primarily focuses on agricultural product trends. The most frequent keywords include "agricultural product," "demand," "global trend," "personal relationship," and "prospect." This cluster appears to explore the future prospects of agricultural products, considering global trends and personal relationships that may influence demand. The keywords "agricultural sustainability," "application," "data," "future trend," "information," and "prospect" indicate that researchers in this cluster are likely investigating sustainable agricultural practices and their applications in meeting future demand. Cluster 2 encompasses 7 items and revolves around topics related to agricultural policy and food security. The most prominent keywords are "agricultural policy," "food security," "general trend," "job," "person," "perspective," and "sustainable agriculture." This cluster suggests that researchers are examining the impact of agricultural policies on food security while considering the perspectives of individuals involved in agriculture. It also indicates a focus on sustainable agriculture as part of broader policy discussions.

Cluster 3 contains 7 items and centers on farm management and water-related trends. The prevalent keywords include "farm management," "driver," "literature," "long-term trend," "major trend," and "water." This cluster suggests that researchers are exploring the management of farms and its drivers, with a particular emphasis on long-term and major trends. Water is a key focus, indicating a concern for sustainable water management practices in agriculture. Cluster 4 comprises 7 items and highlights trends related to climate and productivity. The main keywords include "climate," "productivity," "development trend," "efficiency," "further distribution," "rainfall," and "temperature." Researchers in this cluster seem to be investigating the impact of climate on agricultural productivity and efficiency. The keywords "development trend" and "further distribution" suggest an interest in strategies to cope with climate-related challenges.

Cluster 5 includes 7 items and explores trends in the environment and organic farming. Key terms in this cluster are "environment," "organic farming," "challenges," "opportunity," "sustainable agricultural," and "sustainable development." Researchers in this cluster likely focus on the environmental challenges and opportunities associated with sustainable agricultural practices, particularly organic farming. This cluster reflects an interest in balancing environmental concerns with sustainable development goals. Cluster 6 consists of 4 items and is centered on "important trends." The primary keyword is "important trend," with additional terms like "challenge," "rice," and "significant impact." This smaller cluster may indicate a specific focus on identifying and

addressing significant trends and challenges, potentially related to rice production and its broader implications.

**Table 3.** Citations Analysis

Citations	Authors and year	Title
9299	D Tilman, KG Cassman, PA Matson, R Naylor (2002)	Agricultural sustainability and intensive production practices
7984	JA Foley, N Ramankutty, KA Brauman, ES Cassidy (2011)	Solutions for a cultivated planet
6982	I Scoones (1998)	Sustainable rural livelihoods: a framework for analysis
6673	JN Galloway, AR Townsend, JW Erisman, M Bekunda (2008)	Transformation of the nitrogen cycle: recent trends, questions, and potential solutions
6609	MEA Millennium ecosystem assessment (2005)	Ecosystems and human well-being
5978	EC Oerke (2006)	Crop losses to pests
4939	D Tilman, J Fargione, B Wold, C D'antonio, A Dobson (2001)	Forecasting agriculturally driven global environmental change
4708	JL Monteith (1977)	Climate and the efficiency of crop production in Britain
4408	DB Lobell, W Schlenker, J Costa-Roberts (2011)	Climate trends and global crop production since 1980
4335	MA Altieri (2018)	Agroecology: the science of sustainable agriculture

Source: Data Processing Results (2023)

These highly cited publications collectively address the intricate challenges of sustainable crop management, emphasizing the need to balance agricultural sustainability, address environmental concerns, manage nitrogen cycles, and integrate ecological principles to promote resilience, all vital aspects in ensuring a sustainable future for agriculture.

**Table 4.** Keywords Analysis

Most occurrences		Fewer occurrences	
Occurrences	Term	Occurrences	Term
46	Farm	14	Agricultural policy
45	challenge	14	Significant impact
33	Data	13	Long term trend
33	Application	13	Information
31	Sustainable development	13	Sustainable agricultural production
29	productivity	12	Rainfall
28	perspective	12	Rice
28	prospect	12	Climate
25	Efficiency	12	Farm management

25	Sustainable agriculture	12	Personal relationship
25	Food security	11	Futher distribution
25	Future trend	11	Challenges
23	Job	11	Important trend
23	Major trend	10	Agricultural sustainability
22	Driver	10	General trend

Source: Data Processing Results (2023)

#### **Most Occurrences:**

The term "farm" is the most frequently occurring term in your dataset, reflecting the central focus on farming practices within sustainable crop management. This indicates a strong emphasis on the management and operation of agricultural systems. The term "challenge" is closely behind in terms of occurrences, suggesting that researchers frequently address the challenges and difficulties associated with sustainable crop management. These challenges could encompass environmental, economic, or social aspects. "Data" is another highly occurring term, highlighting the importance of data-driven approaches in sustainable crop management research. Data collection and analysis play a crucial role in understanding and improving agricultural practices. "Application" implies a focus on the practical implementation of sustainable crop management strategies. Researchers are likely exploring how sustainable practices can be applied in real-world agricultural contexts. Sustainable development is a central theme in sustainable crop management, emphasizing the need to achieve agricultural goals while safeguarding environmental and social well-being.

#### **Fewer Occurrences:**

The term "agricultural policy" appears less frequently, indicating that while it is a crucial aspect of sustainable crop management, it may not be as extensively discussed as other topics. "Significant impact" suggests a focus on the consequences and outcomes of agricultural practices, with less frequent discussion compared to broader topics. Long-term trends in sustainable crop management receive moderate attention, indicating potential research gaps in understanding how sustainable practices evolve over time. The term "information" is less frequently discussed, suggesting that information dissemination and communication aspects may be underrepresented in the literature. Sustainable agricultural production, while a critical component, is discussed relatively less frequently, indicating a potential area for more in-depth exploration.

#### **Discussion**

In our bibliometric analysis of sustainable crop management research, we observed significant trends and patterns that shed light on the field's dynamic nature. One prominent finding is the substantial growth in research publications over the past four decades, indicating the increasing global emphasis on sustainable agricultural practices. This growth is aligned with the urgent need to address environmental challenges, enhance food security, and ensure the sustainability of agricultural systems. Our analysis of highly cited publications underscores the foundational works that have shaped the discourse in sustainable crop management. Works by authors like Tilman, Foley, and Scoones have not only set the stage for research but continue to influence current thinking and practice in the field. These influential works cover diverse topics, including environmental sustainability, pest management, and the integration of ecological



principles into agriculture. The exploration of co-authorship networks reveals the collaborative nature of sustainable crop management research.

These networks illuminate clusters of researchers with shared interests and expertise, suggesting the presence of research groups and collaborative initiatives. Such collaborations are essential for the cross-pollination of ideas, sharing of best practices, and the advancement of sustainable agricultural solutions. Additionally, our analysis of emerging research themes provides a glimpse into the future of sustainable crop management. Themes like climate-resilient agriculture, agroecology, and sustainable urban farming signify the field's adaptability to address contemporary challenges, such as climate change, resource scarcity, and urbanization.

## 5. CONCLUSION

In conclusion, this bibliometric study has offered valuable insights into the trends, influential works, collaborative networks, and emerging research themes within sustainable crop management. The growing number of publications underscores the field's increasing importance in the global effort to address food security and environmental sustainability. The influential works identified in this study serve as foundational references for researchers, policymakers, and practitioners seeking to engage with the core literature in sustainable crop management. These works provide a wealth of knowledge that continues to inform and shape the trajectory of the field. The co-authorship networks reveal the collaborative spirit of sustainable crop management research, emphasizing the importance of multidisciplinary teamwork to tackle complex challenges. Collaboration across institutions and regions is vital for the development and dissemination of sustainable agricultural practices. The emergence of new research themes reflects the adaptability and responsiveness of the field to evolving global challenges. As climate change, technological advancements, and urbanization reshape the agricultural landscape, researchers are poised to explore innovative approaches to sustainable crop management.

In essence, this study contributes to a deeper understanding of sustainable crop management's dynamic and evolving nature. The findings provide valuable guidance for researchers, policymakers, and agricultural practitioners as they work together to address the pressing challenges and opportunities in sustainable agriculture, ultimately ensuring a more secure and sustainable food future for all.

## REFERENCES

- [1] A. Taqwa, Y. Bow, S. Effendi, G. Rinditya, and M. Y. Pratama, "Analysis of Air Fuel Ratio on Combustion Flames of Mixture Waste Cooking Oil and Diesel using Preheating Method," in *International Conference on Sustainable Agriculture, Food and Energy (SAFE)*, Chiang Mai Rajabhat University-THAILAND, 2019.
- [2] M. Simanjuntak and I. M. Sukresna, "Acceleration E-Business Co-Creation for Service Innovation Toba Lake Tourism MSME," in *International Conference on Sustainable Environment, Agriculture and Tourism (ICOSEAT 2022)*, Atlantis Press, 2022, pp. 873–885.
- [3] N. T. Oktaviani, E. P. Purnomo, L. Salsabila, and A. T. Fathani, "Bibliometric analysis of sustainable agriculture on human rights governance approach: concept of sustainability on human rights governance," in *E3S Web of Conferences*, EDP Sciences, 2021, p. 2008.
- [4] P. R. Hobbs, K. Sayre, and R. Gupta, "The role of conservation agriculture in sustainable

- agriculture," *Philos. Trans. R. Soc. B Biol. Sci.*, vol. 363, no. 1491, pp. 543–555, 2008.
- [5] R. Prasad, A. Bhattacharyya, and Q. D. Nguyen, "Nanotechnology in sustainable agriculture: recent developments, challenges, and perspectives," *Front. Microbiol.*, vol. 8, p. 1014, 2017.
- [6] S. H. Muhie, "Novel approaches and practices to sustainable agriculture," *J. Agric. Food Res.*, p. 100446, 2022.
- [7] E. E. Oldfield, M. A. Bradford, and S. A. Wood, "Global meta-analysis of the relationship between soil organic matter and crop yields," *Soil*, vol. 5, no. 1, pp. 15–32, 2019.
- [8] F. A. Edwards, D. P. Edwards, S. Sloan, and K. C. Hamer, "Sustainable management in crop monocultures: the impact of retaining forest on oil palm yield," *PLoS One*, vol. 9, no. 3, p. e91695, 2014.
- [9] D. Singh *et al.*, "Crop residue burning and its relationship between health, agriculture value addition, and regional finance," *Atmosphere (Basel)*, vol. 13, no. 9, p. 1405, 2022.
- [10] T. Doré *et al.*, "Methodological progress in on-farm regional agronomic diagnosis. A review," *Agron. Sustain. Dev.*, vol. 28, pp. 151–161, 2008.
- [11] E. S. M. R. Abo Zahra, "IMPACT OF FOLIAR AND SOIL FERTILIZATION ON PRODUCTIVITY AND QUALITY OF SOME SOYBEAN CULTIVARS UNDER CALCAREOUS SOIL CONDITIONS," *Zagazig J. Agric. Res.*, vol. 47, no. 4, pp. 867–881, 2020.
- [12] S. V. Saraswati, "Pengaruh Brand Image dan Brand Trust Terhadap Keputusan Pembelian.," 2018.
- [13] C. Paisley, "Skill gaps in formal higher agricultural education: a youth perspective," ... *Conference on "Young People, Farming á Food .... future-agricultures.org*, 2012.
- [14] H. Omari, "Analysis of honey value chain and honey value adding activities for traditional beekeeping." Sokoine University of agriculture, 2010.
- [15] I. Krisnawati, I. A. Ubaidi, H. Rais, and R. L. Batu, "Strategi Digital Marketing dalam Perdagangan Hasil Tani untuk Meningkatkan Pendapatan Kabupaten Karawang," *J. Ilm. Ekon. Glob. Masa Kini*, vol. 10, no. 2, p. 70, 2019, doi: 10.36982/jiegmk.v10i2.838.
- [16] Y. Tang, S. Dananjayan, C. Hou, Q. Guo, S. Luo, and ..., "A survey on the 5G network and its impact on agriculture: Challenges and opportunities," ... *Electron. ...*, 2021.
- [17] J. Vrchota, M. Pech, and I. Švepešová, "Precision Agriculture Technologies for Crop and Livestock Production in the Czech Republic," *Agriculture*, vol. 12, no. 8, p. 1080, 2022.
- [18] D. Franzen and D. Mulla, "A history of precision agriculture," *Precis. Agric. Technol. Crop farming*, pp. 1–20, 2015.
- [19] K. Toriyama, "Development of precision agriculture and ICT application thereof to manage spatial variability of crop growth," *Soil Sci. Plant Nutr.*, vol. 66, no. 6, pp. 811–819, 2020.
- [20] Y. Iskandar and T. Sarastika, "Study of Socio-Economic Aspect and Community Perception on The Development of The Agricultural Area Shrimp Ponds in Pasir mendit and Pasir Kadilangu," *West Sci. J. Econ. Entrep.*, vol. 1, no. 01, pp. 28–36, 2023.
- [21] D. Budiman, Y. Iskandar, and A. Y. Jasuni, "Millennials' Development Strategy Agri-Socio-Preneur in West Java," in *International Conference on Economics, Management and Accounting (ICEMAC 2021)*, Atlantis Press, 2022, pp. 315–323.
- [22] Y. Iskandar, A. Ardhiyansyah, and U. B. Jaman, "The Effect of Leadership, Supervision, and Work Motivation of the Principal on Teacher Professionalism at SMA Yadika Cicalengka, Bandung Regency," in *International Conference on Education, Humanities, Social Science (ICEHoS*

- 2022), Atlantis Press, 2023, pp. 460–468.
- [23] M. Sahaidak, M. Tepliuk, V. Zhurylo, N. Rudenko, and O. Samko, "Integrative Viewpoint for Implementing Sustainable Management Agricultural Business Excellence.," *TEM J.*, vol. 10, no. 1, 2021.
- [24] H. S. EL-Mesery, A. I. EL-Seesy, Z. Hu, and Y. Li, "Recent developments in solar drying technology of food and agricultural products: A review," *Renew. Sustain. Energy Rev.*, vol. 157, p. 112070, 2022.
- [25] A. Sridhar, A. Balakrishnan, M. M. Jacob, M. Sillanpää, and N. Dayanandan, "Global impact of COVID-19 on agriculture: role of sustainable agriculture and digital farming," *Environ. Sci. Pollut. Res.*, vol. 30, no. 15, pp. 42509–42525, 2023.
- [26] L. Marafa, J. May, and V. A. Tenebe, "Upscaling Agriculture and Food Security in Africa in Pursuit of the SDGs: What Role Does China Play?," *Africa Sustain. Dev. Goals*, pp. 165–175, 2020.
- [27] A. Mishra, P. Kumar, and J. W. Ketelaar, "Improving rice-based rainfed production systems in Southeast Asia for contributing towards food security and rural development through sustainable crop production intensification," *Food*, vol. 1, pp. 102–123, 2016.
- [28] N. McCarthy, T. Kilic, J. Brubaker, S. Murray, and A. de la Fuente, "Droughts and floods in Malawi: impacts on crop production and the performance of sustainable land management practices under weather extremes," *Environ. Dev. Econ.*, vol. 26, no. 5–6, pp. 432–449, 2021.
- [29] A. Stefoska-Needham and L. Tapsell, "Considerations for progressing a mainstream position for sorghum, a potentially sustainable cereal crop, for food product innovation pipelines," *Trends Food Sci. & Technology*, 2020.