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Research Article

Agribusiness In the Era of Innovation – A Bibliometric Analysis of Technology Adoption in Agribusiness

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Abstract

The study conducts a bibliometric analysis of Technology Adoption in Agri-business, with particular emphasis on the evolution of research in the era of innovation. The study trying to examine the publication trends, thematic progression, and emerging research directions associated with technology-driven transformation in Agri-business. A total of 488 scholarly journal articles in Scopus database were retrieved and analysed to achieve the objectives of the study. A PRISMA Diagram is used to show the identification, filtration, and selection procedures employed in finalizing the data set. And bibliometric analysis was performed using R studio with the Biblioshiny package and VOS viewer for scientific mapping and visualisation. The study includes several bibliometric indicators and visualisation techniques including annual scientific production, country-wise scientific production, Most cited documents, keyword analysis, thematic mapping and analysis of the most relevant authors and journals in the field. The findings indicate a notable increase in scholarly contributions related to technology Adoption in Agri- business reflecting the growing significance of innovation, digitalization, and sustainable technological practices in modern agricultural systems. And also, this study reveals existing research gaps which is beneficial for future researchers

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KEYWORDS: Agribusiness, Agricultural technology, Agri-Tech, Agri-innovation, Agripreneurship, Bibliometric.

1. INTRODUCTION

In recent decades, technology has emerged as a central point worldwide. The integration of advanced technology has transformed different sectors such as agriculture, manufacturing, healthcare, educational service, finance etc... Among these sectors, one of the most prominent technological trends is increasingly evident within the agricultural sector[(1)]. Technological adoption in agriculture has created new avenues for the emergence and growth of agricultural entrepreneurial opportunities. This trend is clearly reflected in World Bank statistics which indicate that Global agri-business investment is expected to reach a value of 2.9 trillion USD by 2030 (World Bank 2013)[(2)]. So, agri-business innovation is critical for developing countries to achieve social and economic progress. Agriculture remains one of the most fundamental sectors of the global economy serving as the preliminary source of food, raw material, employment and income for a significant proportion of the world population. Beyond its traditional role in food production, agriculture has increasingly evolved into a complex system of interconnected activities commonly referred to agri-business. A shift from agriculture to agripreneurship is an essential pathway to revitalise agriculture and to make it more attractive and profitable venture [(3)]. It represents a dynamic interface between agriculture and entrepreneurship emphasizing innovation, risk taking, market-oriented, and aiming to achieve profit by efficiently using resources and engaging in activities that add value to agricultural products[(4)]. Furthermore, Agri-business contributes to social inclusion by creating employment opportunities. While innovation has become a defining feature of contemporary agripreneurship. Adoption of innovation among Agripreneurs is influenced by the provision of technical support, productivity enhancement, risk and uncertainty management and access to information and digital tools[(5)]. So agricultural entrepreneurs should be trained and updated with the latest tools and technologies in order to improve their competitiveness [(6)]. Technologies facilitate the transformation of traditional farming into precision farming, digital agriculture, machine learning, GIS, GPS and Robotics etc... The application of precision farming technology significantly improves the efficiency of agricultural enterprises leading to higher crop yields. Smart agriculture also known as digital farming or smart farming involves the use of technology to collect, generate, transmit, store and analyse data in order to enhance decision making across all stages of the entire farming process[(7)]. The integration of machine learning and GIS significantly supports precision agriculture where satellite, drones, web mapping technology and advanced analytical models are extensively applied in contemporary agri-business [(8)]. As a result, technology is progressively recognized as more than a mere supportive tool, serving instead as a strategic resource that foster agripreneurial development in an increasingly competitive era.

The present study conducts a bibliometric analysis of 488 articles indexed in the Scopus database. The analysis was performed using VOS viewer and Biblioshiny packages in R studio. These tools help to analyse relevant authors, Thematic Mapping, Keyword Co-occurrences, Annual Scientific Production.

The study aims to address the following research questions.

- What is the relevance of selected research topic.?
- What is the future scope of this research area.?
- What is the year – wise progression in this research area along with its prominent contributors?
- How do keyword dynamics evolve within the research domain.?
- Which are the most cited documents in the research field.?

Exploring these research questions highlights the significance of the topic and provides a comprehensive understanding of previous studies and their findings, current research trends and potential future research directions within the study area. The evaluation further highlights the most influential contributors, productive countries and dominant research themes in the area. It also helps to trace the evolution and find under explored areas which requiring further attention.

2. RESEARCH METHODOLOGY

Research methodology is a science of studying how data is collected, processed, and analysed to answer the research questions. It includes the theoretical analysis of methods and principles relevant to the field of study, covering concepts such as paradigms, theoretical models, research phases, and both quantitative and qualitative techniques. Furthermore, research methodology not only guides the scientific investigation and the results obtained but also helps in understanding the process of inquiry itself.

3. MATERIALS AND METHODS

For data collection the Scopus database was used as the main source of bibliographic records. A comprehensive search strategy was developed using relevant keywords such as “Agripreneurs”, “Agripreneurship”, “agricultural technology”, “agribusiness”, “agricultural startups”, “agroenterpreneurship”, “Agri startups”,” agricultural innovation ventures”, “Agri-tech”, “Agri-based technology”, “Agri innovation”, “Agri digital solutions”, “technology in agripreneurship”. Boolean operators specifically (AND) and (OR), were used to construct precise and reliable search strings. It helps to improve retrieval accuracy. The dataset comprised publications between 2000 to 2026 enabling a longitudinal examination of developments within the field.

Inclusion criteria

Research articles specifically related to agribusiness and its adoption of different technologies were included in the study. The analysis was limited to publications written in English to maintain consistency. Furthermore, the selection was restricted to articles categorised under the subject areas of Business, Management, Accounting, Economics, Econometrics, and Social Sciences to ensure the relevance of the dataset to the research objectives.

Exclusion Criteria

To ensure the accuracy and relevance of the dataset publications not directly related to the core theme of the topic were excluded from the analysis.

Period
The study contains articles published from 2000 to 2026.

SOURCES AND PROCEDURES
The data extraction process began with the retrieval of 2,343 documents from the Scopus database. To ensure time consistency the dataset was first limited to publications from 2000 to 2026, which reduced the number of records to 2,292. Subsequently, subject-area filtering was applied to include only studies categorized under Business, Management and Accounting; Finance, Economics, Econometrics and Social Sciences, resulting in 1,407 documents. The dataset was further refined by restricting the document type exclusively to journal articles, thereby narrowing the sample to 745 records. A language filter was then applied to retain only English-language publications, reducing the count to 670 articles. After identifying and removing five duplicate entries, 665 unique records remained. Finally, a screening process was conducted to assess each article's relevance and alignment with the objectives of the study. Leading to a final dataset of 488 articles, which constituted the basis for the bibliometric analysis. The PRISMA chart showing the search strategy, inclusion, exclusion criteria and final selection of articles are shown in the Figure 1.

4. REVIEW OF LITERATURE
This section critically reviews existing studies related to the research topic to establish a conceptual and theoretical foundation for the study.

Agribusiness
Sikhulumile Sinyolo MM.(2017)[9] The study states that challenges, competition, and opportunities of the changing business environment in agricultural industry have forced farmers to become entrepreneurs. Dewi DE, Cahyani PNA, Megawati LR.(2022)[10] the study addressed that the limited awareness and insufficient resources among Agripreneurs are the major barriers to the slow adoption of technologies. Prihadyanti, D., & Aziz, S. A. (2023)[11] the study finds that the barriers faced by Agripreneurs could be solvable with the introduction of young entrepreneurs. Because they can more effectively introduce technologies to agribusiness. Norbertus Citra Irawan I, Jangkung Handoyo Mulyo AS(2023)[12] Study suggest that Agripreneurs could be agents of innovation and developments in agriculture by trying new farming techniques, adopting sustainable agricultural practices or agricultural business with innovative approaches. Dobryagina, N.(2020)[13] the study revealed Governments consistently aim to strengthen the agricultural sector due to its vital contribution to the economy; therefore, promoting entrepreneurial skills among farmers is considered an effective strategy for its development. Pindado, E., Sánchez, M., Verstegen, J. A. A. M., & Lans, T. (2018).[14] The study suggest that farmers competence and entrepreneurial developments are required for the growth of agricultural sector. Imelda I, Hidayat R, Aritonang M. Agrar J Agribus Rural Dev Res.(2022)[15] Its says that creativity, risk bearing capacity, hard work, resource utilization and ability to identify opportunities all are entrepreneurial skills or behaviours. Rao N M V A L and Kumar V (2016)[16] the study reveals that entrepreneurship development within the agricultural sector and its related activities is commonly known as agripreneurship which involves adopting innovative methods and processes in agriculture and allied sectors.

Technology in Agribusiness
Imam Abdulrahman Bin Faisal University, Akinwale Y, Grobler W(2023)[17] This study concentrated on Africa. In Africa, traditional farming practices are becoming less suitable as available agricultural land decreases due to population growth. Therefore, investing in new technologies is essential to improve crop yields and livestock production. And agripreneurship plays a crucial role in ensuring food security. Ismayilzada M, Safarova T, Novruzova U, Abbasova S.(2025)[18]The study examines the use of innovative technologies in agribusiness creating profitability. Technologies such as precision farming systems, process automation, and the use of electrical machinery have significantly reduced the operational costs in agribusiness. Abban R, Kifle Abebe G.(2022)[19]The study addresses combined effect of COVID-19 and rapid global technological change have highlighted digitalization as an important strategy for expanding Africa's agribusiness sector. Berthet E.T., Hickey G.M., Klerkx L., (2018)[20] the study finds nowadays, agriculture is increasingly viewed as an industry driven by technology, where innovation helps in enhancing productivity. Adhichunchanagiri University(2019)[21] the study proves adoption of smart agriculture improves agribusiness performance and allows Agripreneurs to conserve both time and resources by utilizing precision farming, GIS, and GPS technologies. BRENES, E. R., Montoya, D., & Ciravegna, L. (2014)[22] the study explained future success of agribusiness will depend heavily on strategic thinking, especially regarding the effective use of technology.

5. DISCUSSION
This bibliometric analysis gives a clear overview of the research progress and main trends in agribusiness. The results show a steady increase in the number of research publications in recent years which highlights the growing role of technologies in agribusiness. Important research areas such as precision agriculture, artificial intelligence, blockchain technology, smart farming, sustainability, and digital supply chain management have become major focus areas in the field. So, it is evident that Agribusiness is gradually moving towards more technological innovations nowadays.

6. RESULTS
488 Scopus articles selected and used for performing bibliometric analysis. Details of Final results are presented below.

Publication by Year
The annual scientific production trends of the research topic are depicted in Figure 2. An annual scientific production chart is a bibliometric visualization that illustrates the number of publications produced with in a specific research field over a defined period. This chart helps to identify trends in research

activity, such as growth patterns, fluctuations or periods of decline thereby offering insights in to the development and maturity of a research domain. One of the bibliometric indicators annual scientific productions are essential for mapping the evolution of scientific output and understanding research dynamics across time [23] In the early years 2000s to mid- 2010s, publication output is very low and increases slowly, indicating limited research activity during that period. However, in the period from 2011 to 2020 shows series of fluctuations, with both upward and downward movements in publication numbers. It reflecting variations in research output during these years. Notably the period from 2020 onwards exhibits a sharp and sustained raising publication output. The greatest surge in publication volume occurred in 2022. Sustained growth highlights the increased relevance of the topic in recent years.

Most Cited Countries

The table 1 presents the most cited countries in the study, and their total citations per article. The United States clearly leading contributor in this field with the highest total citations (1780) indicating its central role and strong scholarly output. The United Kingdom although producing fewer total citations than the USA stands out for its very high average citations per article (58.5).

Most Cited Authors

The table 2 summarises author productivity based on the total number of articles published. Singh R is the most prominent author with 8 publications, indicating high contribution to the field. Maryono J and Nain MS follow with 6 articles each.

Most Cited Documents

The table 3 presents the list of selected papers along with their corresponding total citation counts. It highlights the most influential studies in the field, Altieri (2011) 'J peasant study receiving the highest number of total citations followed by Naresh M (2019), Birner R (2021) and Carbonell (2016).

Country's Scientific Production

The table 4 presents the country – wise frequency of publications. Brazil emerges as the most productive country with 148 publications followed by India (141) and the United States (116). Other substantially contributing countries are Indonesia (73), Ukraine (67) and China (63).

Tree Map

The Figure 3 tree map visually represents the frequency of words in the document. The keyword analysis presents the most frequently used term is" agribusiness" it appeared 188 times based on data retrieved from the Scopus data base. The biggest rectangle indicates higher frequency of occurrence. Other frequently appearing keywords such as "agriculture", "agro-industry", "innovation", "sustainability", "entrepreneurship" and "agripreneurship".

Keyword Co-Occurrences

The Figure 4 keyword co-occurrences map represents how research topics in agribusiness are connected based on their joint appearance. Larger nodes represent more frequently used keywords while the connecting lines show how often these terms occur. The Green cluster on the left is dominated by agribusiness and closely related terms such as agro-industry and agro-industrialisation, indicating a strong focus on business aspects of agriculture. The red cluster near the centre is mainly associated with sustainability and sustainable development, showing that environmental and long-term development concerns are closely integrated with agribusiness studies. The purple cluster highlights innovation and relate concepts, emphasizing technological change and innovation driven transformation within the sector.

Thematic Map

The Figure 5 thematic map represents the structure and development of research themes within the field of agribusiness, highlighting the relevance and degree of development. The map is divided into 4 quadrants and each bubble represents a group of related keywords. The upper right quadrant indicates motor themes such as "agroindustry"," agricultural technology" and "food security" which means these are well developed and highly connected to the agribusiness research. The upper left quadrant represents niche themes here it is "development and "management" they are highly developed but less central and more specialised. "agribusiness", "sustainability" and "agripreneurship" are in the lower left quadrant which means emerging or declining themes, it has important opportunity for future research.

Most Relevant author Affiliation

The figure 6 presents the most relevant author affiliations based on the number of articles published in the study area. Wageningen university and research leads with 13 publications followed by the Empresa Brasileria De Pesquisa Agropecuaria – EMBRAPA, with 12 articles and the university of Universidade De Sao Paulo with 9 articles Michigan state university Tamilnadu agricultural university each contributed 8 articles, ICAR (Indian Agricultural Research Institute) recorded 6 publications.

Most Relevant Journal

The figure 7 depicts the most relevant journals based on the number of documents published in the study area. International Food and Agribusiness Management Review have the highest number of publications (39), followed by sustainability (Switzerland) (14) and Custos E Agronegocio (13). Frontiers in Sustainable Food Systems also contributes a considerable number of studies with 10 publications.

Co Authorship Network Analysis

The figure 8 presents a country wise co- authorship network analysis. it illustrating the collaborative relationships among nations in the selected research domain. From the visualisation it is evident that certain countries such as United Staes, India and Germany occupy central positions in the network,

suggesting that they are major contributors in international research collaborations. conversely smaller nodes represent countries with limited international collaborations.

7. CONCLUSION

Here, 488 documents collected from the Scopus database are used. The annual scientific production analysis shows that the number of publications was very low in 2000. But it has increased steadily over the years indicating growing interest of researchers in the field of agribusiness. In terms of citations, the United States leads with the highest total citations (1780), revealing its strong academic influence in this field. The most cited author is Sing R, while the most cited document is the 2011 article by Miguel Altieri published in The Journal of Peasant Studies. Regarding research productivity by country, Brazil ranks first, followed by India. The tree map analysis reveals that "agribusiness" is the most frequently occurring keyword, appearing 188 times in the selected articles. In terms of institutional contribution, Wageningen University & Research has the highest number of affiliated authors. The most relevant journal in this research area is the International Food and Agribusiness Management Review. Finally, the keyword co-authorship analysis using VOSviewer shows that the United States, India, and Germany are the major contributors to international research collaborations.

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About the Author

Athira Prakasan is a Research Scholar at Government College Mananthavady, affiliated with Kannur University, Kerala, India. She qualified for the Junior Research Fellowship (JRF) in the NTA UGC NET December 2025 examination. Her academic interests focus on Commerce and Business Studies with a special interest in Entrepreneurship and Marketing. And committed to contributing to scholarly discussions through research and academic writings.

Table 1: Most Cited Countries

Country	TC	Average Article Citations
USA	1780	37.9
BRAZIL	599	17.1
UNITED KINGDOM	468	58.5
INDIA	326	7.8
CHINA	289	11.1
NETHERLANDS	253	23
SPAIN	233	25.9
AUSTRALIA	210	21
CANADA	184	20.4
INDONESIA	180	8.2
ITALY	141	35.2
GERMANY	123	11.2
COSTA RICA	114	57
KENYA	95	11.9
PORTUGAL	90	30

Note: Top 15 countries with their total and average article citations.

Table 2: Most Cited Authors

Authors	Articles	Articles Fractionalized
SINGH R	8	1.84209957
MARIYONO J	6	4.41666667
NAIN MS	6	1.00876623
ADEYANJU D	4	0.80952381
BANNOR RK	4	1.41666667
MBURU J	4	0.80952381
MIGNOUNA D	4	0.80952381
BEN AMARA D	3	1.33333333
CHEN H	3	1.33333333
CHUMO C	3	0.47619048
CONNOLLY AJ	3	1.16666667
GITURO W	3	0.47619048
GRAY AW	3	0.78333333
HALL RJ	3	0.86666667
KUMAR A	3	0.65833333

Note: Top 15 most cited authors and their articles in the specific research area.

Table 3: Most Cited Documents

Paper	DOI	Total Citations	TC per Year	Normalized TC
Altieri Ma, 2011, J Peasant Stud	10.1080/03066150.2011.582947	845	52.8125	7.56921824
Naresh M, 2019, Int J Recent Technol Eng		210	26.25	10.5

Birner R, 2021, Appl Econ Perspect Policy	10.1002/aepp. 13145	197	32.8333333	9.27389444
Carbonell Im, 2016, Internet Policy Rev	10.14763/2016.1.405	170	15.4545455	7.27272727
Geldes C, 2015, J Bus Res	10.1016/j.jbusres.2014.09.034	149	12.4166667	6.1443299
Briones-Peñalver Aj, 2018, Corp Soc Responsib Environ Manage	10.1002/csr.1448	146	16.2222222	6.73375262
Rao Nh, 2007, Technol Forecast Soc Change	10.1016/j.techfore.2006.02.002	141	7.05	2.59509202
Bowen R, 2019, J Rural Stud	10.1016/j.jrurstud.2019.10.031	139	17.375	6.95
Mahbub M, 2020, Internet Thing	10.1016/j.iot.2020.100161	132	18.8571429	6.875

Note: Top 9 most cited documents with their per year citations.

Table 4: Country's Scientific Production

Region	Frequency
BRAZIL	148
INDIA	141
USA	116
INDONESIA	73
UKRAINE	67
CHINA	63
NIGERIA	29
ITALY	27
KAZAKHSTAN	27
AUSTRALIA	23
UK	23
GERMANY	22
KENYA	22
SPAIN	22
NETHERLANDS	21

Note: Top 15 countries and their frequency of production.

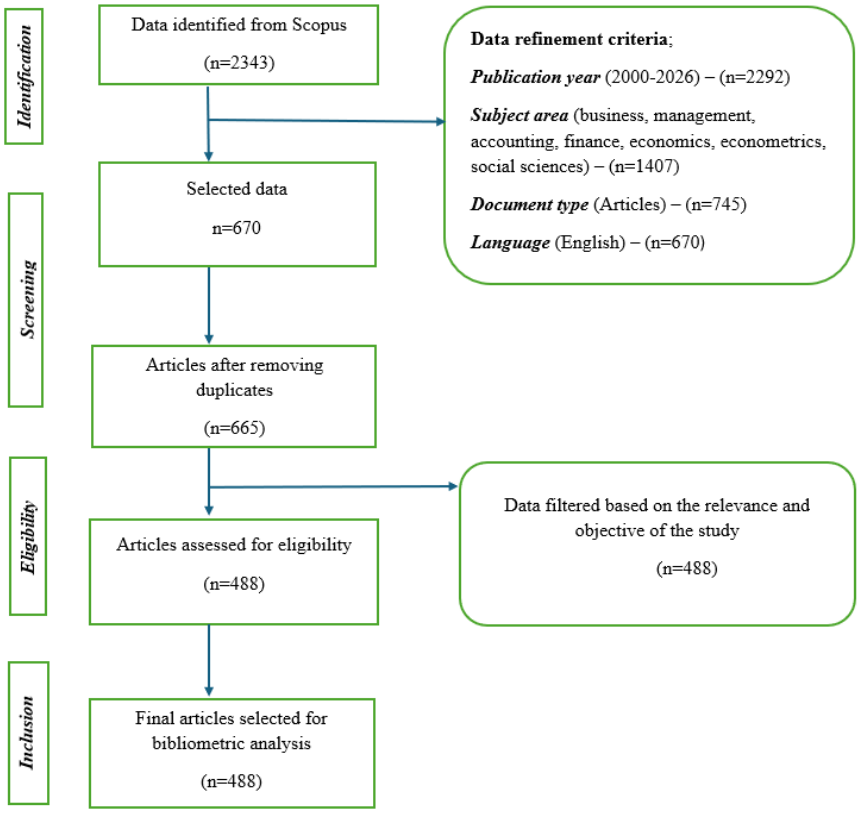

Figure 1: Prisma Chart

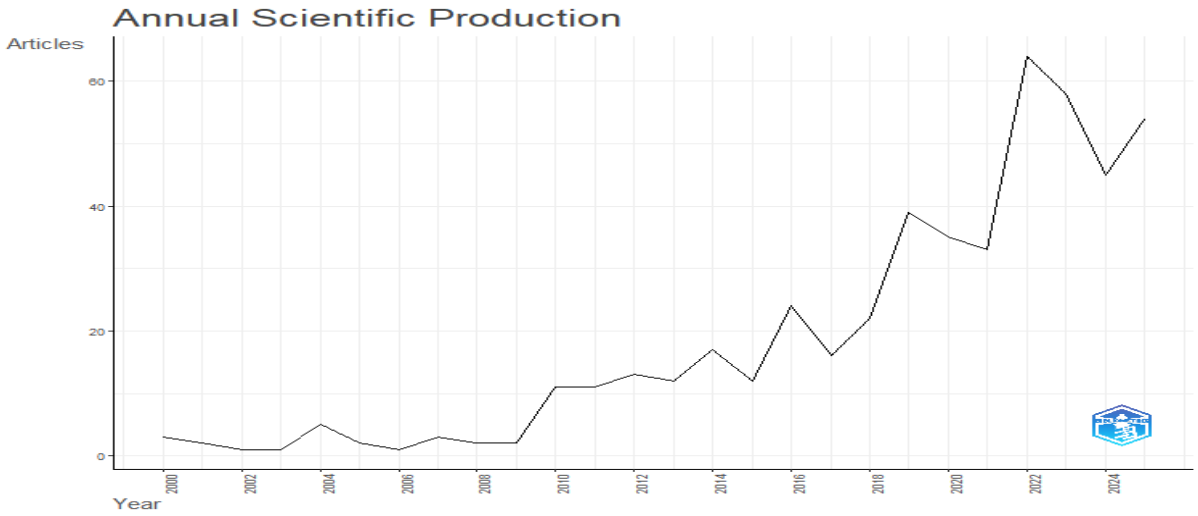

Figure 2: Publication By Year

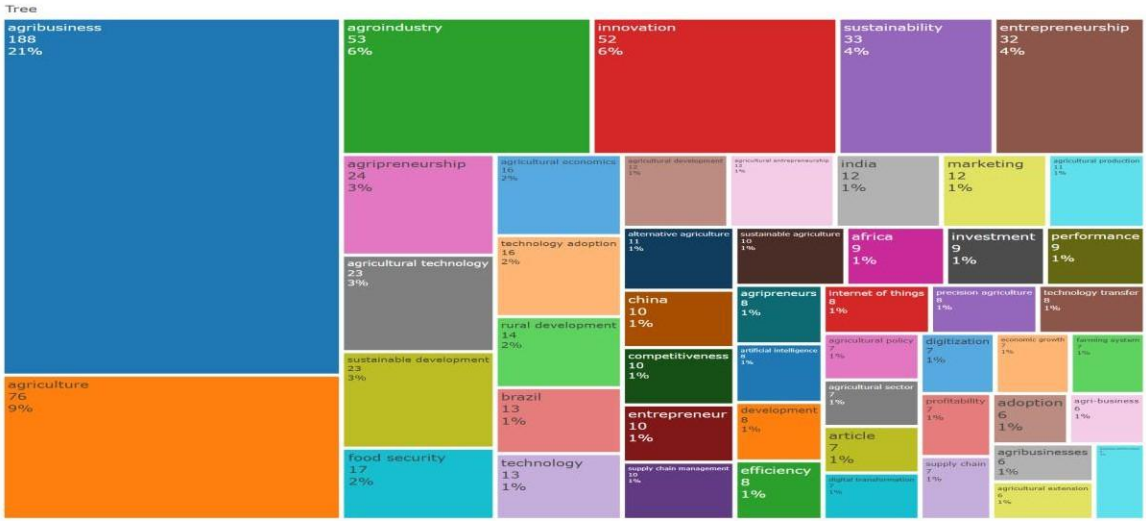

Figure 3: Tree Map

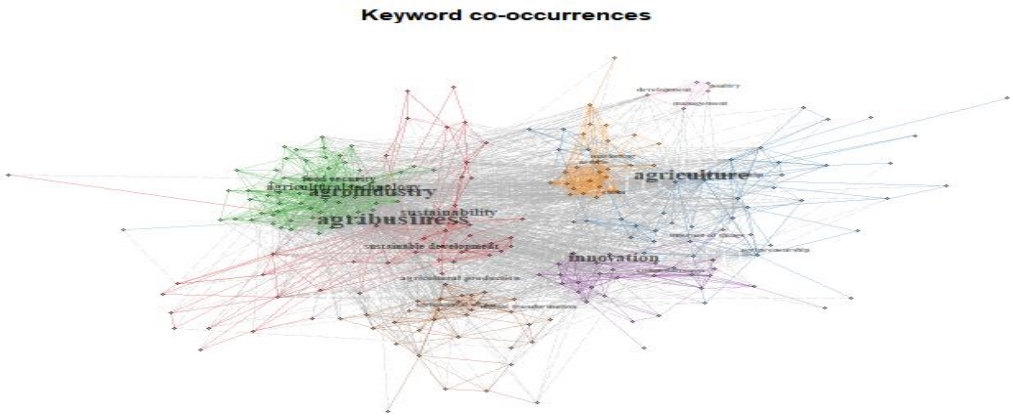

Figure 4: Keyword Co-Occurrences

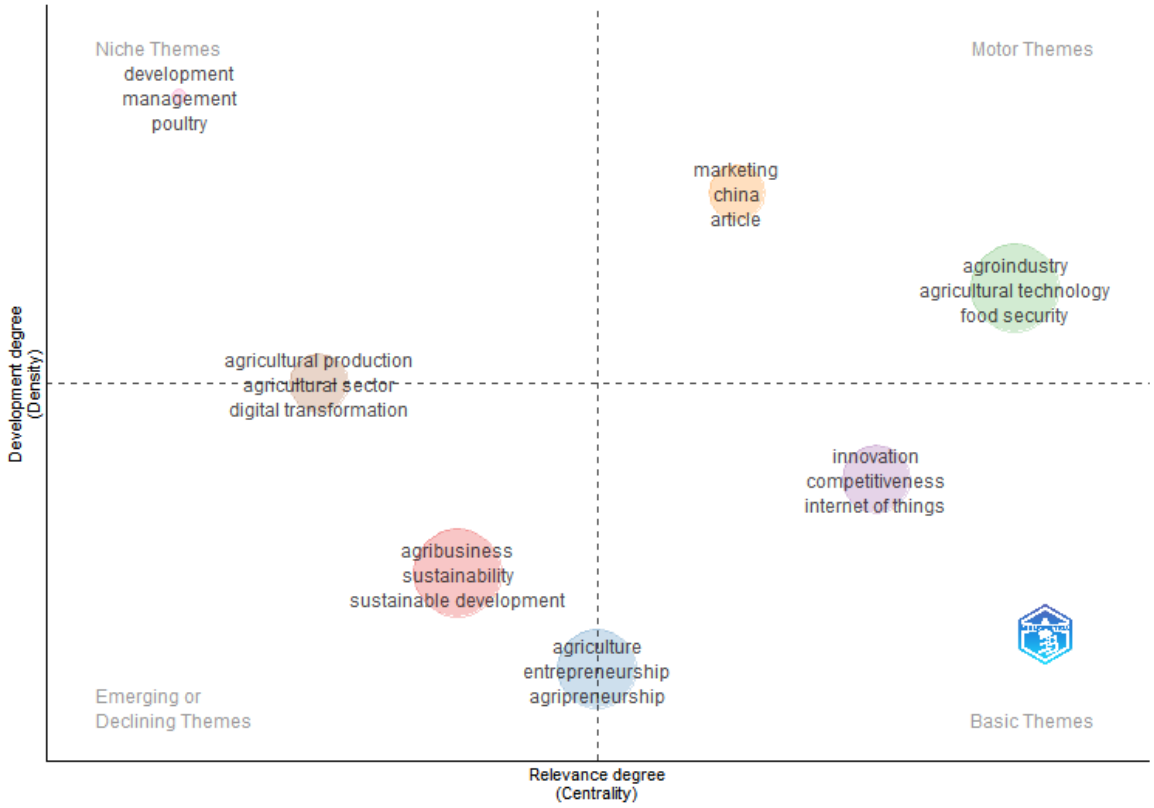

Figure 5: Thematic Map

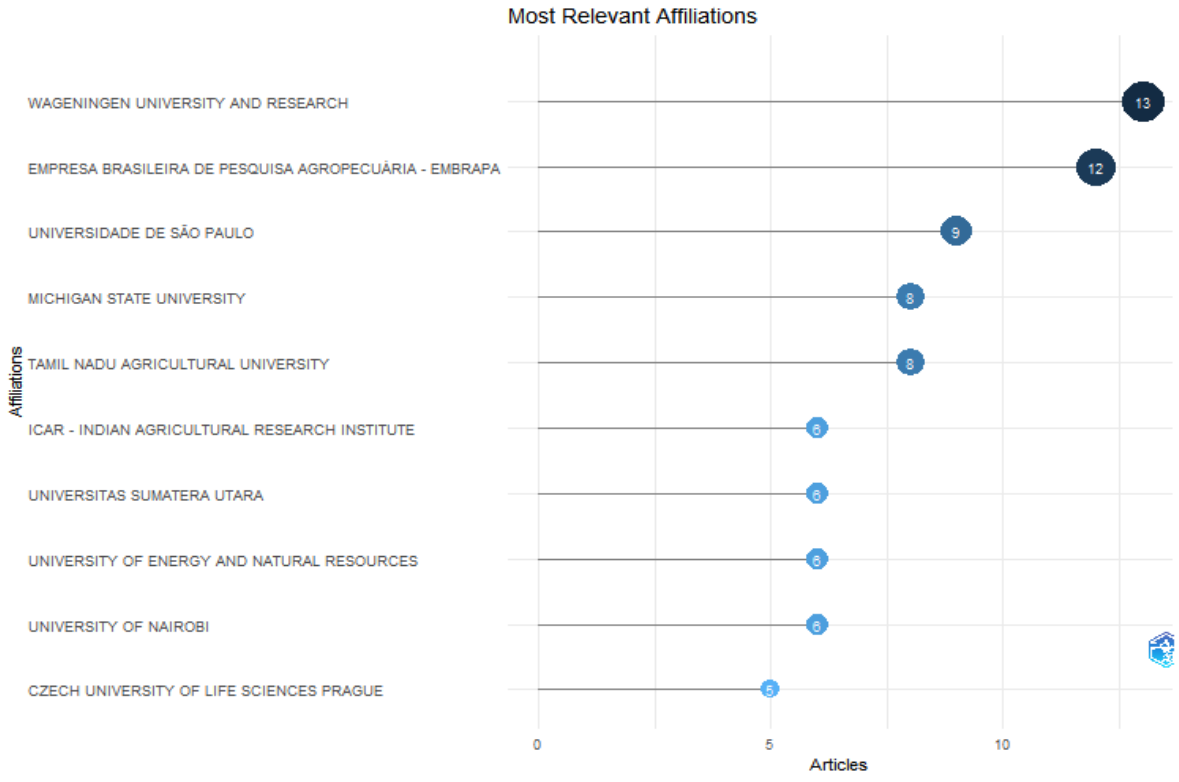

Figure 6: Most Relevant Author Affiliation

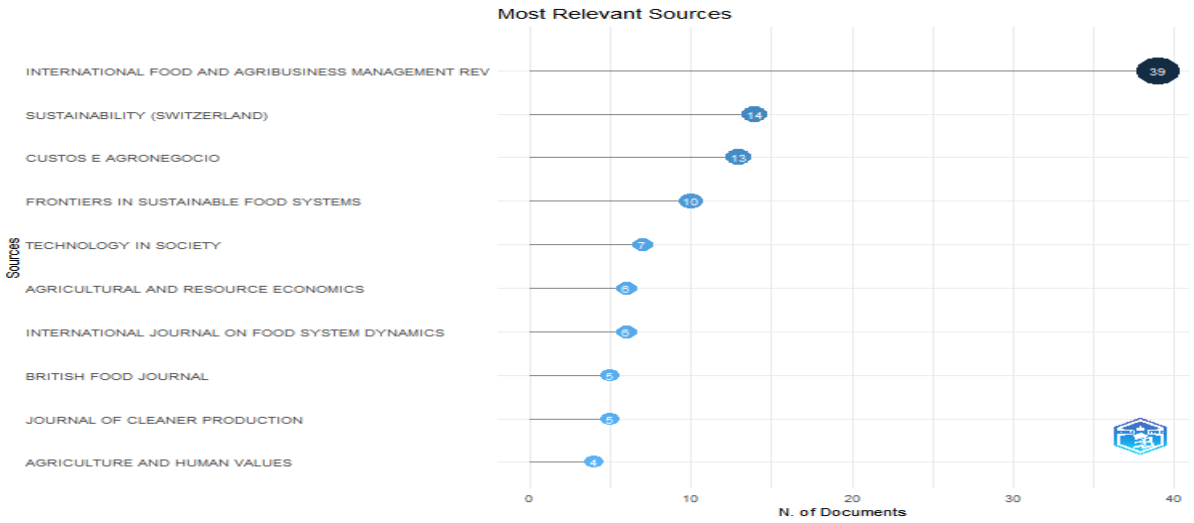

Figure 7: Most Relevant Journal

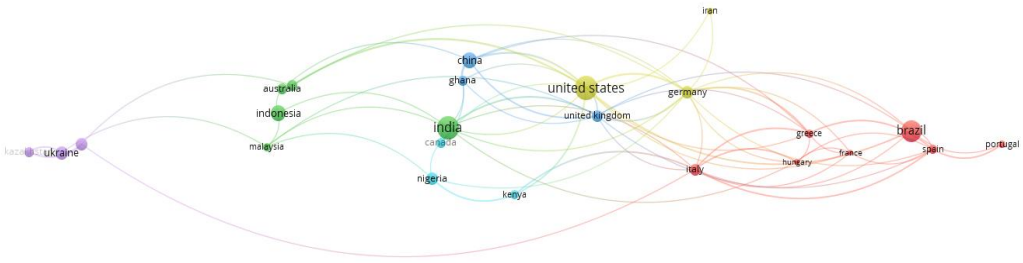

Figure 8: Co-Authorship Network Analysis based on Countries in Vos Viewer