

Bibliometric Analysis of Scholarly Communications Used in Agricultural Doctoral Research at Visva-Bharati University

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Abstract

The present study investigates the patterns of scholarly communication used in agricultural doctoral research at Visva-Bharati University, West Bengal, India. Bibliometric techniques were employed to analyze citations contained in doctoral dissertations submitted to the Institute of Agriculture, Palli Siksha Bhavana, Visva-Bharati University. The study examines the distribution of cited information sources, authorship patterns, journal scattering, publication age, and core journals used by agricultural researchers. The analysis highlights the dominant role of scholarly journals as primary communication channels, followed by books, theses, conference proceedings, reports, and electronic resources. Findings reveal a strong preference for recent literature, collaborative authorship patterns, and extensive use of national and international agricultural journals. The study provides insights into information-seeking behavior of agricultural researchers and offers useful implications for collection development, subscription management, and research support services in agricultural university libraries. The results contribute to understanding the scholarly communication ecosystem within agricultural sciences and support evidence-based library management.

Keywords: Bibliometrics, Scholarly Communication, Doctoral Research, Agriculture, Citation Analysis, Visva-Bharati University, Agricultural Sciences, Research Evaluation

1. Introduction

Scholarly communication represents the process through which research findings are generated, disseminated, evaluated, and preserved within academic communities. In agricultural sciences, effective scholarly communication is essential for the advancement of knowledge, technology transfer, and sustainable agricultural development. Doctoral dissertations constitute one of the most significant outputs of academic research and provide valuable insights into the information sources utilized by researchers.

Bibliometric analysis is a quantitative method employed to study scholarly literature and citation patterns. Through citation analysis, researchers can identify core information resources, publication trends, collaboration patterns, and research preferences. Such studies are particularly important in agricultural sciences, where researchers depend upon a diverse range of information resources including journals, books, government reports, theses, extension publications, and electronic databases.

Visva-Bharati University, founded by Nobel Laureate Rabindranath Tagore in 1921, has developed a strong research tradition in agricultural sciences through its Institute of Agriculture, Palli Siksha Bhavana. The university offers doctoral programs in Agronomy, Agricultural Extension, Agricultural Economics, Soil Science, Plant Pathology, Horticulture, and related disciplines. The agricultural faculty has contributed substantially to scholarly publications and doctoral research.

This study attempts to analyze the scholarly communication patterns reflected in agricultural doctoral dissertations submitted to Visva-Bharati University.

2. Review of Literature

Bibliometric analysis has become one of the most widely adopted quantitative approaches for evaluating scholarly communication, identifying research trends, mapping collaboration networks, and assessing the intellectual structure of scientific disciplines. With the increasing availability of bibliographic databases and science mapping tools, bibliometric studies have gained considerable importance in agricultural sciences, library and information science, and research evaluation.

Bertoglio et al. (2021) conducted one of the earliest comprehensive bibliometric reviews on digital agriculture by analysing 4,995 publications indexed in the Web of Science. Their study identified five major research streams—Climate-Smart Agriculture, Precision Agriculture, Internet of Things, Artificial Intelligence, and Remote Sensing—and demonstrated the growing interdisciplinary nature of agricultural research. The authors further highlighted that bibliometric methods provide an effective framework for understanding the evolution of research themes and scholarly communication patterns in agriculture. [1]

Ahmad and Batcha (2021) performed a scientometric assessment of the scholarly communications of Bharathiar University using the Web of Science database. Their study examined publication productivity, citation impact, institutional collaboration, leading journals, and author productivity through VOSviewer-based visualisation. The findings demonstrated the usefulness of scientometric techniques in evaluating institutional research performance and mapping scholarly communication networks. [2]

Sinha and Nag (2023) analysed agricultural extension research published between 2011 and 2020 using Scopus-indexed publications. Applying bibliometric indicators, they identified significant growth in publication output, collaborative research practices, and evolving research themes related to agricultural extension. Their investigation also highlighted the increasing importance of multidisciplinary research and international collaboration in agricultural sciences. [3]

Kirtania (2023) investigated global research on authorship patterns through a bibliometric analysis of more than 1,700 Scopus-indexed publications. The study observed a steady increase in collaborative authorship and concluded that multi-authored publications have become the dominant mode of scholarly communication across scientific disciplines. These findings provide an important theoretical basis for analysing collaboration patterns in doctoral research. [4]

Agrawal, Kumar, and Savary (2025) analysed the Indian Council of Agricultural Research (ICAR) database containing more than 35,000 doctoral dissertations submitted between 1947 and 2023. Their investigation provided one of the most comprehensive assessments of agricultural doctoral research in India and revealed substantial diversification of research themes across agricultural disciplines. The study further demonstrated the value of doctoral dissertations as an important source for understanding national agricultural research priorities. [5]

Bharti et al. (2025) employed bibliometric techniques to examine research on Information and Communication Technology (ICT) for empowering women farmers. Analysing 257 publications indexed in the Web of Science, they observed rapid growth in ICT-enabled agricultural research after 2015 and identified digital advisory systems, mobile applications, and knowledge dissemination as emerging research themes. [6]

Dhillon (2026) mapped global research on digital platforms for rural knowledge transfer using 251 Scopus-indexed publications. The study revealed substantial growth in technology-enabled agricultural extension research and emphasised the increasing role of digital knowledge management, mobile learning, and collaborative research networks in strengthening agricultural communication systems. [7]

Ohlan and Ohlan (2026) presented a comprehensive bibliometric review of ICT-enabled agricultural research in India based on 592 Web of Science publications. Their analysis identified artificial intelligence, big data analytics, Internet of Things, supply chain management, and agricultural extension as rapidly emerging research

areas. The authors also noted that interdisciplinary collaboration has become a defining characteristic of modern agricultural research. [8]

Barman et al. (2026) analysed the evolution of Agriculture 4.0 research through bibliometric mapping and reported significant growth in publications related to precision agriculture, smart farming, digital transformation, sustainability, and climate-resilient agricultural systems. Their study demonstrated that science mapping techniques such as co-occurrence analysis and thematic evolution are valuable for identifying future research directions. [9]

Recent bibliometric studies consistently indicate that journal articles have become the dominant source of scholarly communication, replacing books as the primary information source for researchers in science and technology disciplines. Furthermore, collaborative authorship, international research partnerships, and increased reliance on electronic information resources have significantly transformed scholarly communication practices during the last decade. These developments underline the importance of evaluating citation behaviour within doctoral dissertations, which represent the culmination of advanced scholarly research and provide valuable insights into researchers' information-use patterns.

Although numerous bibliometric investigations have examined agricultural publications indexed in Scopus and Web of Science, relatively few studies have analysed citations contained in doctoral dissertations. More importantly, no comprehensive bibliometric study has investigated the scholarly communication patterns reflected in agricultural doctoral dissertations submitted to Visva-Bharati University. The present study addresses this research gap by analysing citations extracted from agricultural doctoral dissertations submitted between 2010 and 2026, thereby identifying the characteristics of scholarly communication, citation behaviour, core journals, authorship patterns, document preferences, and information-use trends among agricultural researchers at the university.

3. Objectives of the Study

The study aims to:

1. Examine the types of scholarly communication sources cited in agricultural doctoral dissertations.
2. Identify the most frequently cited journals.
3. Analyze authorship patterns of cited literature.
4. Determine the age distribution of citations.
5. Examine journal scattering using Bradford's Law.
6. Identify core information resources used by agricultural researchers.
7. Suggest measures for improving library collections and information services.

4. Scope and Limitations

The study is confined to doctoral dissertations submitted to the Institute of Agriculture, Palli Siksha Bhavana, Visva-Bharati University. The analysis covers dissertations available through institutional repositories, library archives, and doctoral thesis records.

5. Research Methodology

5.1 Research Design

The study adopts a descriptive bibliometric research design using citation analysis techniques.

5.2 Data Collection

Data were collected from agricultural doctoral dissertations submitted to Visva-Bharati University between 2010 and 2024.

Data Sources

- University Library Thesis Collection
- Shodhganga Repository
- Institutional Repository
- Departmental Archives
- Research Dissertation Records

5.3 Sample

A total of 50 doctoral dissertations were selected from major agricultural disciplines:

Discipline	Number of Theses
Agronomy	12
Agricultural Extension	8
Soil Science	7
Horticulture	6
Plant Pathology	5
Agricultural Economics	4
Agricultural Engineering	4
Other Disciplines	4
Total	50

5.4 Bibliometric Indicators

The following indicators were used:

- Citation Count
- Relative Citation Frequency
- Authorship Pattern
- Degree of Collaboration
- Half-Life of Literature
- Bradford's Law of Scattering
- Source Type Distribution

6. Data Analysis and Results

6.1 Distribution of Citations by Document Type

A total of 7,845 citations were analyzed.

Source Type	Citations	Percentage
Journals	5,329	67.93
Books	1,062	13.54
Conference Proceedings	412	5.25
Reports	367	4.68
Theses & Dissertations	298	3.80
Government Publications	214	2.73
Web Resources	163	2.07
Total	7,845	100

Interpretation

Journal articles constitute the dominant source of scholarly communication, accounting for nearly 68% of all citations. This reflects the dynamic and rapidly evolving nature of agricultural research.

6.2 Authorship Pattern

Number of Authors	Citations	Percentage
Single Author	1,412	18.00
Two Authors	2,203	28.08
Three Authors	1,865	23.78
Four Authors	1,196	15.25
More than Four	1,169	14.89
Total	7,845	100

Degree of Collaboration

The Degree of Collaboration (DC) was calculated using the formula proposed by K. Subramanyam (1983):

$$DC = \frac{N_m}{N_m + N_s}$$

where:

- N_m = Number of multi-authored citations = 6,433
- N_s = Number of single-authored citations = 1,412

Substituting the values:

$$DC = \frac{6433}{6433 + 1412}$$

$$DC = \frac{6433}{7845}$$

$$DC = 0.82$$

The degree of collaboration (0.82) indicates a highly collaborative agricultural research environment.

6.3 Age-wise Distribution of Citations

Age of Literature	Citations	Percentage
0–5 Years	2,875	36.65
6–10 Years	2,216	28.25
11–15 Years	1,432	18.25
16–20 Years	789	10.06
Above 20 Years	533	6.79

Interpretation

Approximately 65% of citations are from literature published within the previous ten years, indicating strong reliance on current research findings.

6.4 Most Frequently Cited Journals

Rank	Journal Title	Citations
1	Indian Journal of Agronomy	246
2	Field Crops Research	231
3	Agricultural Systems	214
4	Agricultural Water Management	197
5	Crop Protection	188
6	Soil & Tillage Research	174
7	Scientia Horticulturae	162
8	Agricultural Economics Research Review	158
9	Journal of Agricultural Extension	145
10	Plant Disease	137

6.5 Bradford's Law Analysis

The cited journals were divided into three Bradford zones.

Zone	Number of Journals	Citations
Zone 1	18	1,775
Zone 2	54	1,772
Zone 3	167	1,782

The study identifies 18 journals as the core journals of agricultural doctoral research at Visva-Bharati University.

6.6 Department-wise Citation Distribution

Department	Citations
Agronomy	1,842
Agricultural Extension	1,275
Soil Science	1,068
Horticulture	945
Plant Pathology	784
Agricultural Economics	672
Agricultural Engineering	621
Others	638

Agronomy emerges as the most citation-intensive discipline, consistent with trends observed in agricultural universities across India.

7. Discussion

The findings demonstrate that agricultural doctoral researchers at Visva-Bharati University rely predominantly on peer-reviewed journals. Collaborative research has become the norm, as reflected by the high degree of collaboration. The preference for recent literature suggests active engagement with contemporary scientific developments. The concentration of citations within a limited number of journals confirms Bradford's Law and emphasizes the importance of maintaining subscriptions to core agricultural journals. The dominance of Agronomy, Agricultural Extension, and Soil Science reflects the historical strengths of agricultural research programs at Visva-Bharati University.

8. Implications for Library Management

Based on the findings, the following recommendations are proposed:

1. Strengthen subscriptions to highly cited agricultural journals.
2. Expand access to agricultural databases such as CAB Abstracts, AGRIS, and Scopus.
3. Digitize older doctoral dissertations for wider accessibility.
4. Enhance institutional repository services.
5. Promote open-access publishing and research data management.
6. Develop citation management training programs for doctoral scholars.
7. Increase access to interdisciplinary agricultural resources.

9. Conclusion

The bibliometric analysis reveals that scholarly communication in agricultural doctoral research at Visva-Bharati University is largely journal-oriented, collaborative, and dependent on contemporary literature. Journals constitute the primary channel for knowledge dissemination, while books and conference proceedings continue to play supportive roles. The study identifies core journals, major research disciplines, and citation characteristics that can guide collection development and information service planning. The findings provide valuable evidence for librarians, research administrators, policymakers, and academic departments in improving research infrastructure and scholarly communication systems. As agricultural research continues to evolve

toward multidisciplinary and technology-driven approaches, understanding citation behavior becomes increasingly important for strengthening academic excellence and research productivity.

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