

A BIBLIOMETRIC STUDY OF SCHOLARLY COMMUNICATIONS CITED IN DOCTORAL DISSERTATIONS OF THE INSTITUTE OF AGRICULTURE

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ABSTRACT

The present study undertakes a comprehensive bibliometric investigation of the scholarly communications cited in doctoral dissertations submitted to the Institute of Agriculture over a period spanning 2010 to 2023. A total of 105 dissertations, containing 8,058 references, were systematically analysed to determine the citation patterns, typology of referenced documents, most frequently cited journals, chronological distribution of cited literature, authorship trends, and the geographic origin of sources. The findings reveal that research journal articles constitute the predominant category of cited literature (52.34%), followed by books and monographs (23.28%), and conference proceedings (10.32%). Among the 105 dissertations analysed, the average citation count per dissertation was found to be 76.74, with the highest density observed in the domains of Horticulture and Soil Science. Bradford's Law of Scattering was applied to identify core journals in agricultural research, with the Indian Journal of Agronomy, Field Crops Research, and Current Science emerging as the most heavily cited periodicals. Chronological analysis disclosed that the median age of cited literature was 14.3 years, demonstrating a moderate reliance on recent scholarship balanced with engagement with seminal agricultural texts. The geographical distribution of citations highlighted a near-equal distribution between domestic Indian sources (47.31%) and international publications (52.69%), underscoring the global orientation of agricultural doctoral research in India. These findings carry significant implications for library acquisition policies, curriculum development, and the strengthening of scholarly communication infrastructure within agricultural universities.

Keywords: Citation Analysis¹, Bibliometrics², Doctoral Dissertations³, Institute of Agriculture⁴, Scholarly Communication⁵, Bradford's Law⁶, Agricultural Research India⁷.

1. INTRODUCTION

Scholarly communication forms the intellectual backbone of all doctoral research, and nowhere is this more evident than in the reference lists appended to doctoral dissertations. These reference lists serve as empirical windows into the information-seeking behaviour of researchers, their disciplinary boundaries, and the breadth of intellectual engagement that characterises advanced academic inquiry. In the agricultural sciences, where knowledge evolves at the intersection of field experimentation, laboratory investigation, policy analysis, and environmental science, the nature and pattern of citations offer invaluable insights into the state of the discipline as it is practised within a given institution. The Institute of Agriculture, as a premier centre for advanced agricultural education and research in India, generates doctoral dissertations that reflect both national research priorities and global scientific discourse. Systematically studying the citations contained within these dissertations is therefore an exercise of both academic and practical significance. The present study is grounded in the bibliometric tradition established by Pritchard [2], who formally introduced the term 'bibliometrics' to describe the application of statistical and mathematical methods to the study of books and other media. Subsequent contributions by Price [5], Garfield [4], and Bradford [14] laid the empirical foundations for citation analysis as a methodological tool. In the Indian context, citation studies of doctoral theses in library science, social sciences, and agricultural sciences have been conducted intermittently, but comprehensive investigations focusing specifically on agricultural institutes remain sparse. This study endeavours to fill that lacuna by providing a systematic, data-driven analysis of citation behaviour in a well-defined institutional corpus.

1.1 SIGNIFICANCE OF CITATION ANALYSIS IN AGRICULTURAL RESEARCH

Citation analysis in the context of agricultural science carries a significance that extends well beyond academic curiosity. Agricultural research in India is underpinned by institutions such as the Indian Council of Agricultural Research (ICAR) [27] and is governed by frameworks including the University Grants Commission (UGC) Ph.D. regulations [28]. Within this institutional architecture, doctoral dissertations represent the frontier of new knowledge generation, and the references cited within them reveal which journals, authors, books, and reports are driving that frontier. Understanding these citation patterns enables university libraries to make evidence-based acquisition decisions, ensures that students and faculty have access to the most relevant scholarly resources, and helps administrators benchmark their research culture against national and international standards. Furthermore, citation analysis can reveal disciplinary fragmentation or integration, identify seminal works that anchor entire sub-fields, and track the temporal diffusion of ideas across sub-disciplines of agriculture.

Bibliometric indicators derived from citation analysis, such as impact factors, h-indices, and Bradford zones, are now widely used in academic evaluation globally [26]. In the Indian agricultural education system, where NAAC accreditation and ICAR recognition depend partly on research output quality, institutional bibliometric profiling has become increasingly important. The present study contributes to this profiling exercise by

documenting, with empirical precision, the scholarly information sources that doctoral researchers at the Institute of Agriculture have found most valuable and have most frequently consulted in the production of their research.

1.2 OBJECTIVES OF THE STUDY

The primary objective of this study is to analyse the citation patterns embedded in doctoral dissertations submitted to the Institute of Agriculture between 2010 and 2023, with the intention of identifying the types of documents most frequently cited, the most influential journals, the temporal distribution of cited sources, the geographical origins of cited literature, and the degree to which Bradford's Law of Scattering is applicable in this disciplinary domain. Secondary objectives include assessing subject-wise citation density across agricultural sub-disciplines, computing the average number of citations per dissertation, and identifying the core list of periodicals that account for the majority of scholarly citations. The study further aims to compare its findings with analogous citation studies conducted in other Indian agricultural universities, thereby situating the Institute of Agriculture within a broader national research landscape. These objectives collectively serve to generate a detailed, evidence-based profile of scholarly communication as practised in doctoral agricultural research at the institutional level.

1.3 SCOPE AND LIMITATIONS OF THE STUDY

The scope of this study is delimited to doctoral dissertations submitted to and approved by the Institute of Agriculture during the period 2010–2023. A total of 105 dissertations were identified through the institutional repository and library catalogue as the study universe. Only the reference lists appended at the end of each dissertation were analysed; in-text citations, footnotes, and endnotes were excluded from the count unless they corresponded to items appearing in the final reference list. The study does not examine the quality or accuracy of citations, nor does it assess whether cited works were actually read or merely formally referenced. Dissertations with incomplete or illegible reference lists were excluded from the sample. The study is further limited by the fact that certain dissertations cited unpublished reports, personal communications, and grey literature that could not be classified with standard bibliographic precision, and these were aggregated under the 'Others' category. Despite these limitations, the 8,058 citations analysed constitute a statistically robust sample that permits the drawing of generalisable conclusions about citation behaviour within the institution.

2. REVIEW OF RELATED LITERATURE

The discipline of bibliometrics, as formally conceptualised by Pritchard [2] and subsequently elaborated by Price [5] in his seminal analysis of scientific networks, has generated a substantial body of empirical citation studies across diverse disciplines. Garfield's [4] development of citation indexing through the Science Citation Index established the methodological infrastructure upon which modern citation analysis rests. In the library and information science domain, Aiyengar [7] conducted one of the earliest systematic citation studies of library

science dissertations in India, establishing foundational patterns that later studies would revisit and refine. Chikate and Patil [8] extended this tradition, examining theses in library and information science with particular attention to journal usage and half-life calculations. Their findings, which showed a strong preference for journal articles over books among LIS researchers, were subsequently echoed in citation studies across other disciplines.

In the domain of agricultural sciences, Mangala and Dharmappa [9] produced a highly significant investigation of dissertations submitted to the University of Agricultural Sciences, Dharwad, finding that journals accounted for approximately 48% of all citations and that the average number of citations per dissertation was 63. Their identification of core agricultural journals through Bradford's Law provided a template that subsequent studies adopted with modifications. Amsaveni and Muthusami [18] similarly investigated citation patterns in agricultural dissertations, reporting that the average dissertation cited 72 sources and that Indian journals accounted for approximately 43% of all journal citations, a figure somewhat lower than the domestic share found in the present study. Murugan and Venkatesan [24] examined dissertations from Tamil Nadu Agricultural University and reported a median literature age of approximately 12 years, somewhat lower than the 14.3-year median age observed in the present study, suggesting that the Institute of Agriculture's doctoral researchers engage more extensively with foundational literature than their counterparts at certain other institutions.

Gupta [19] provided a broader macro-level bibliometric analysis of Indian agricultural research output across a decade, establishing that soil science and agronomy were the most productive sub-fields and that international collaboration was increasing. Saravanan and Dominic [20] analysed citation patterns in the Indian Journal of Agricultural Sciences specifically, finding high self-citation rates and a strong domestic orientation. Nagpaul [17] examined citations in social science dissertations and introduced important methodological considerations regarding the appropriate statistical treatment of citation frequency distributions, considerations that have informed the present study's analytical framework. Thanuskodi [10] contributed a comprehensive citation study of doctoral theses in library science, establishing benchmarks for citation density and literature half-life that proved useful comparison points for studies in adjacent disciplines.

Bradford's Law [14], originally formulated in the context of scientific literature scattering, has been repeatedly tested in agricultural science contexts. Brookes [13] provided the most mathematically rigorous reformulation of this law, demonstrating its applicability across diverse scientific literature sets. In the present study, Bradford's Law is applied to the journal citation data to identify the core, second-zone, and third-zone journals, thereby facilitating evidence-based collection development. Line and Sandison [12] offered important practical guidance on interpreting citation and library use studies, cautioning against over-generalisation from citation counts and advocating for the contextualisation of quantitative findings within qualitative descriptions of disciplinary culture, a principle that informs the discussion section of the present paper. Dutta [25] specifically examined half-life of agricultural literature in India, reporting an overall median age of 11.8 years, a figure lower than the

present study's finding of 14.3 years, possibly reflecting the broader temporal scope of the dissertations examined here.

More recently, Nisha and Jange [29] examined scholarly communication and citation patterns in Indian agricultural journals, finding that open-access resources were increasingly featuring in citation lists, though traditional print journals retained dominance. Padhi and Panda [30] conducted a bibliometric study of Indian agriculture research with a focus on international collaboration, finding that citations to United States-based publications constituted the largest foreign citation category, a pattern consistent with the present study's finding (20.28% from the USA). Falagas et al. [26] provided a comparative analysis of major academic databases relevant to citation retrieval, highlighting differences in coverage that may affect citation studies depending on the retrieval tool used. The review of literature thus situates the present study within a well-established research tradition while identifying specific areas where the present investigation extends or refines existing knowledge.

3. METHODOLOGY

The present study adopts a quantitative bibliometric methodology, drawing on the citation analysis tradition established in the information science literature. The study universe was defined as all doctoral dissertations successfully submitted to and approved by the Institute of Agriculture during the thirteen-year period from 2010 to 2023. A census approach was employed rather than sampling, as the total population of 105 dissertations was sufficiently manageable for exhaustive data collection. Each dissertation was accessed through the institutional library, the repository database, or the Shodhganga national theses database, and its reference list was extracted in full. For dissertations available only in physical form, manual extraction was performed. Each reference was then classified according to the typology developed for this study: research journal articles, books and monographs, conference proceedings, theses and dissertations, government reports and institutional documents, websites and online resources, and miscellaneous others including patents and standards. This classification scheme aligns with the categories employed in comparable studies by Mangala and Dharmappa [9] and Amsaveni and Muthusami [18], facilitating comparative analysis.

Following the classification of document types, the data were subjected to frequency analysis to determine citation counts by type, by subject domain, by individual journal, by publication year, and by country of publication. Bradford's Law of Scattering was operationalised by ranking journals by descending frequency of citation and dividing them into three Bradford zones of approximately equal citation totals, with Zone 1 representing the core journals. The median age of cited literature was calculated by arranging all citations in ascending order of publication year and identifying the median value, following the procedure recommended by Line and Sandison [12]. The half-life of cited literature was operationally defined as the age at which 50% of all citations fell, computed from the date of each dissertation's submission. Geographic classification was performed by identifying the country of publication of each cited item through publisher information recorded in

the citation. Where a journal was published in multiple countries or had changed publishing houses, the country of the primary publisher at the time of the cited publication was used.

Data entry and management were conducted using a structured spreadsheet database, with each citation recorded as an individual row containing fields for dissertation ID, year, subject domain, reference type, journal title, publication year, author nationality, and country of publication. Inter-coder reliability was assessed by having a second researcher independently code a random sub-sample of 10% of citations, yielding a Cohen's Kappa of 0.89, indicating near-perfect agreement. Statistical analyses including frequency distributions, percentage calculations, and ranking tables were performed using Microsoft Excel. All tables presented in this study were constructed from the primary dataset and represent original contributions to the bibliometric literature on Indian agricultural doctoral research.

4. DATA COLLECTION AND ANALYSIS

4.1 DISTRIBUTION OF CITATIONS BY DOCUMENT TYPE

Table 1 presents the distribution of 8,058 citations by document type across 105 doctoral dissertations. Research journal articles dominate comprehensively, accounting for more than half of all citations, reflecting the centrality of primary research literature in agricultural doctoral scholarship. Books and monographs represent the second-largest category, underscoring the continued relevance of long-form scholarly texts in a discipline where foundational principles, methodological handbooks, and field manuals remain indispensable reference tools. Conference proceedings, occupying third rank, signal a meaningful engagement with emerging research communicated through professional gatherings, particularly in the rapidly evolving domains of precision agriculture and biotechnology.

Table 1: Distribution of Citations by Document Type (N = 8,058)

S. No.	Type of Reference	Total Citations	Percentage (%)	Rank
1	Research Journal Articles	4,218	52.34	1
2	Books / Monographs	1,876	23.28	2
3	Conference Proceedings	832	10.32	3
4	Theses / Dissertations	512	6.35	4
5	Reports / Government Docs	348	4.32	5
6	Websites / Online Resources	256	3.17	6

7	Others (Patents, Standards)	16	0.22	7
	Total	8,058	100.00	

Note: Percentages are calculated on the basis of total citations (N = 8,058). Rankings are assigned in descending order of citation frequency.

4.2 SUBJECT-WISE DISTRIBUTION OF DISSERTATIONS AND CITATIONS

Table 2 presents the distribution of dissertations and their corresponding citations across six major agricultural sub-disciplines. Agronomy and Crop Science generated the highest total citation volume, consistent with its status as the most numerically represented sub-field in the dissertation corpus. The average citations per dissertation are broadly uniform across most domains, ranging from 75.20 in Agricultural Economics to 80.33 in Horticulture, suggesting a generally consistent citation practice across the Institute. The relatively lower average in Animal Husbandry and Veterinary Science (55.90) may reflect either the smaller literature base in that sub-field or a greater reliance on unpublished experimental data generated within the Institute itself.

Table 2: Subject-wise Distribution of Dissertations and Citations

S. No.	Subject Domain	No. of Dissertations	Total Citations	Avg. Citations / Dissertation
1	Agronomy & Crop Science	28	2,214	79.07
2	Soil Science & Fertility	22	1,756	79.82
3	Plant Pathology & Protection	18	1,437	79.83
4	Agricultural Economics	15	1,128	75.20
5	Horticulture & Floriculture	12	964	80.33
6	Animal Husbandry / Vet. Sci.	10	559	55.90

	Total	105	8,058	76.74
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Note: Average citations per dissertation = Total citations ÷ Number of dissertations per subject domain.

4.3 RANKING OF MOST CITED JOURNALS (BRADFORD'S CORE ZONE)

Table 3 identifies the ten most frequently cited journals and presents their cumulative citation percentages. The application of Bradford's Law to the full journal citation dataset (comprising 312 distinct journal titles) yielded a core zone of 12 journals that together accounted for approximately 50% of all journal citations, a second zone of 43 journals, and a third zone of the remaining 257 journals. The Indian Journal of Agronomy emerges as the single most cited journal, affirming the central role of domestic agricultural periodicals in Indian doctoral research. The presence of internationally published journals such as Field Crops Research (Elsevier), Plant and Soil (Springer), and Soil and Tillage Research in the core zone demonstrates that doctoral researchers at the Institute engage substantively with the global frontiers of agricultural knowledge.

Table 3: Ranking of Most Cited Journals (Top 10 — Bradford's Core Zone Analysis)

Rank	Journal Title	No. of Citations	% of Total Journal Citations	Cumulative %
1	Indian Journal of Agronomy	312	7.40	7.40
2	Journal of Agronomy & Crop Science	287	6.80	14.20
3	Field Crops Research (Elsevier)	261	6.19	20.39
4	Current Science	238	5.64	26.03
5	Plant and Soil (Springer)	196	4.65	30.68
6	Soil & Tillage Research	178	4.22	34.90
7	Agriculture, Ecosystems & Env.	163	3.86	38.76
8	Journal of Soil Science	142	3.37	42.13
9	Annals of Agricultural Sciences	128	3.03	45.16

10	Indian Journal of Horticulture	115	2.73	47.89
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Note: Rankings are based on citation frequency within the journal category (4,218 total journal citations). Percentages are expressed relative to total journal citations. Bradford Core Zone comprises the top 12 journals ($\approx 50\%$ of journal citations).

4.4 CHRONOLOGICAL DISTRIBUTION OF CITED LITERATURE (LITERATURE HALF-LIFE)

Table 4 reveals the temporal distribution of citations across six date ranges. The majority of citations (56.16%) fall within the most recent two decades (2005–2023), indicating that doctoral researchers at the Institute maintain a reasonably contemporary engagement with their literature. Nevertheless, nearly 20% of citations reference publications older than 28 years, suggesting that foundational and classical agricultural science texts retain significant intellectual currency. The median age of cited literature was computed at 14.3 years, and the half-life — the age at which 50% of all citations were published — was similarly approximately 14 years. This figure is somewhat higher than the half-life reported for dissertation citations at Tamil Nadu Agricultural University [24], possibly reflecting the Institute's emphasis on integrating classical plant science and soil chemistry literature into doctoral frameworks.

Table 4: Chronological Distribution of Cited Literature and Half-Life Analysis

Year Range	No. of Citations	% of Total	Cumulative %	Half-Life Classification
2015–2023	1,892	23.48	23.48	Current (0–8 yrs)
2005–2014	2,634	32.68	56.16	Recent (9–18 yrs)
1995–2004	1,976	24.52	80.68	Moderately Dated (19–28 yrs)
1985–1994	987	12.25	92.93	Dated (29–38 yrs)
1975–1984	386	4.79	97.72	Old (39–48 yrs)
Before 1975	183	2.28	100.00	Classic / Seminal
	Total	8,058	100.00	Median Age: 14.3 yrs

Note: Year of analysis base = 2023. Median age is calculated from the publication years of all 8,058 citations. Half-life denotes the age at which 50% of cited literature was published.

4.5 GEOGRAPHIC DISTRIBUTION OF CITED LITERATURE

Table 5 illustrates the country-wise origin of cited literature. India is the largest single-country contributor of citations, but foreign publications collectively constitute a majority (52.69%), indicating the global orientation of doctoral agricultural research at the Institute. The United States and the United Kingdom together account for 31.15% of all citations, reflecting the dominance of English-language agricultural research publishing in these two countries. The Netherlands, as the headquarter of Elsevier — the publisher of several core agricultural journals — features prominently as an indirect indicator of international journal access. The combined citation share of Pakistan and Bangladesh (2.03%) reflects the institutional recognition of South Asian agricultural research, particularly in contexts of shared agro-climatic zones and crop varieties.

Table 5: Geographic Distribution of Cited Literature by Country of Publication

S. No.	Country of Origin	No. of Citations	% of Total	Type (Domestic/Foreign)
1	India	3,812	47.31	Domestic
2	United States of America	1,634	20.28	Foreign
3	United Kingdom	876	10.87	Foreign
4	Netherlands (Elsevier)	612	7.59	Foreign
5	Australia	318	3.95	Foreign
6	Germany	276	3.42	Foreign
7	Canada	198	2.46	Foreign
8	Pakistan / Bangladesh	164	2.03	Foreign
9	Others (Combined)	168	2.09	Foreign
	Total	8,058	100.00	Domestic: 47.31% Foreign: 52.69%

Note: Country of publication is based on the registered address of the primary publisher at the time of the cited publication. Netherlands citations reflect primarily Elsevier-published journals. 'Others' includes 12 countries each contributing < 0.5%.

5. DISCUSSION

The findings of this study, taken together, present a coherent picture of citation behaviour in agricultural doctoral research that is at once institutionally specific and nationally representative. The dominance of journal articles (52.34%) as the primary citation type is consistent with findings across virtually all citation studies in the natural and applied sciences, including those by Mangala and Dharmappa [9], who reported a journal citation share of approximately 48% at the University of Agricultural Sciences, Dharwad, and Amsaveni and Muthusami [18], who found a figure of approximately 50% in their agricultural dissertation study. The marginally higher journal citation rate observed in the present study (52.34%) may reflect the increased availability of digital journal resources through national consortia such as e-ShodhSindhu and NLIST, which have expanded researcher access to international periodical literature in Indian universities over the past decade. The share of book citations (23.28%) is also consistent with the agricultural sciences literature, where standard texts on soil chemistry, plant physiology, agronomy, and crop improvement continue to be widely consulted, though the long-term trend across comparable studies suggests a gradual decline in book citation shares as journal literature becomes more comprehensive and accessible.

The subject-wise citation density data (Table 2) reveal that Horticulture and Floriculture achieved the highest average citations per dissertation (80.33), followed closely by Plant Pathology (79.83) and Soil Science (79.82). This pattern suggests that researchers in these sub-fields engage with a particularly dense literature, possibly because horticulture and plant pathology are characterised by highly specialised and rapidly evolving research fronts where the synthesis of a wide body of prior work is expected of doctoral candidates. The comparatively lower citation density in Animal Husbandry (55.90) deserves further investigation; it may indicate that veterinary and husbandry sciences have stronger traditions of experimental rather than literature-driven research, or it may reflect a more constrained disciplinary literature base in the Indian context. Gupta's [19] national-level bibliometric analysis similarly identified Agronomy and Soil Science as the most intensively cited sub-fields in Indian agricultural research, lending external validity to the present study's discipline-wise findings.

The core journal analysis (Table 3), conducted through Bradford's Law, identified 12 journals accounting for approximately 50% of all journal citations, a finding consistent with the theoretical expectation of Bradford's framework as reformulated by Brookes [13]. The Indian Journal of Agronomy's position at the top of the ranking mirrors its prominence in Saravanan and Dominic's [20] analysis of Indian agricultural journal citations and in Chadha's [23] earlier study of agricultural library citation patterns. The presence of five international journals in the top ten most cited list is noteworthy, as it indicates that even within a strongly domestically oriented research environment — evidenced by the near-parity of domestic and foreign citations in Table 5 — the most impactful scholarship that doctoral researchers engage with is published by internationally reputed journals with broad global readership. This has direct implications for library procurement, as it suggests that subscriptions to core Elsevier, Springer, and Wiley agricultural journals are not merely aspirational but operationally essential for doctoral research support.

The chronological analysis (Table 4) and its derived half-life of 14.3 years merit comparison with analogous studies. Dutta's [25] calculation of an 11.8-year agricultural literature half-life, Murugan and Venkatesan's [24] estimate of approximately 12 years, and the present study's 14.3-year estimate trace a pattern that suggests the Institute of Agriculture's doctoral researchers draw somewhat more extensively on older foundational literature than is typical at comparable institutions. One plausible explanation is the Institute's sustained emphasis on soil science and agronomy — sub-disciplines that draw heavily on classical texts in soil chemistry and plant physiology — compared with institutions where biotechnology and genomics-oriented sub-fields, characterised by very short half-lives, dominate the doctoral portfolio. It is also worth noting that the 23.48% citation share for literature published within the most recent eight years (2015–2023) is somewhat lower than might be expected in a period of rapid digital publication growth, suggesting that the Institute's doctoral researchers maintain a strong historical orientation in their literature reviews.

The geographical distribution of citations (Table 5), with India contributing 47.31% and all foreign sources collectively contributing 52.69%, reflects a balanced internationalism in citation practice. This stands in interesting contrast to Amsaveni and Muthusami's [18] finding of 43% domestic citations, suggesting that the Institute of Agriculture may exhibit a stronger domestic research orientation than some comparable institutions, possibly because of the specific agro-climatic and policy contexts of its location which necessitate reference to India-specific research. The United States' 20.28% citation share is consistent with Padhi and Panda's [30] national-level finding that US publications constitute the largest foreign citation source in Indian agricultural research. The United Kingdom's 10.87% share reflects both its historical role as a centre of agricultural science publishing and the continued prestige of British-published journals in agronomy, soil science, and environmental agriculture. Collectively, the geographic data support the conclusion that Indian agricultural doctoral research is neither parochially inward-looking nor uncritically dependent on foreign literature, but engages in a considered synthesis of domestic and international scholarship.

6. CONCLUSION

This study has provided a comprehensive bibliometric analysis of 8,058 citations embedded in 105 doctoral dissertations submitted to the Institute of Agriculture between 2010 and 2023. The findings establish that research journal articles constitute the predominant citation type (52.34%), that a core group of twelve journals accounts for approximately half of all journal citations, that the median age of cited literature is 14.3 years, and that domestic and international sources contribute to citations in a near-balanced proportion of 47:53. Across all sub-disciplines of agriculture, citation density is consistently high, averaging 76.74 citations per dissertation, signalling a robust culture of scholarly engagement among doctoral researchers. Bradford's Law of Scattering was validated in this dataset, confirming its continued applicability in the agricultural sciences. These findings collectively carry actionable implications for library acquisition strategies, curriculum design, and institutional research policy. Library administrators at the Institute are advised to prioritise subscriptions to the twelve core journals identified through Bradford zone analysis, to maintain robust holdings of classical agricultural

monographs, and to ensure sustained access to international databases. Future research should extend this analysis to a longitudinal comparative framework, tracking shifts in citation patterns over successive decades as the Institute's disciplinary priorities evolve.

REFERENCES

- [1] R. N. Broadus, "Toward a definition of bibliometrics," *Scientometrics*, vol. 12, no. 5–6, pp. 373–379, 1987.
- [2] A. Pritchard, "Statistical bibliography or bibliometrics?" *Journal of Documentation*, vol. 25, no. 4, pp. 348–349, 1969.
- [3] P. Vakkari and B. Cronin, *Conceptions of Library and Information Science: Historical, Empirical and Theoretical Perspectives*. London: Taylor Graham, 1992.
- [4] E. Garfield, *Citation Indexing: Its Theory and Application in Science, Technology and Humanities*. New York: Wiley, 1979.
- [5] D. J. de Solla Price, "Networks of scientific papers," *Science*, vol. 149, no. 3683, pp. 510–515, 1965.
- [6] J. C. Strickland-Hodge and M. B. Allan, "Determining core journals in health sciences librarianship," *Bulletin of the Medical Library Association*, vol. 71, no. 4, pp. 387–393, 1983.
- [7] S. P. Aiyengar, "Citation analysis of dissertations in library science," *Annals of Library Science and Documentation*, vol. 30, no. 3, pp. 128–135, 1983.
- [8] B. Chikate and S. A. Patil, "Citation analysis of theses in library and information science," *Library Philosophy and Practice*, vol. 10, no. 2, 2008.
- [9] P. B. Mangala and B. J. Dharmappa, "Citation analysis of dissertations submitted to University of Agricultural Sciences, Dharwad," *SRELS Journal of Information Management*, vol. 46, no. 3, pp. 311–320, 2009.
- [10] J. Thanuskodi, "Citation analysis of doctoral theses in library and information science," *Journal of Information Science Theory and Practice*, vol. 1, no. 1, pp. 56–71, 2013.
- [11] T. Subramanyam, "Bibliometric studies of research in collaboration: A review," *Journal of Information Science*, vol. 6, no. 1, pp. 33–38, 1983.
- [12] M. B. Line and A. Sandison, "Practical interpretation of citation and library use studies," *College and Research Libraries*, vol. 36, no. 5, pp. 393–396, 1975.

- [13] B. C. Brookes, "Bradford's law and the bibliography of science," *Nature*, vol. 224, no. 5223, pp. 953–956, 1969.
- [14] S. C. Bradford, "Sources of information on specific subjects," *Engineering*, vol. 137, pp. 85–86, 1934.
- [15] G. K. Zipf, *Human Behaviour and the Principle of Least Effort*. Cambridge: Addison-Wesley, 1949.
- [16] A. J. Lotka, "The frequency distribution of scientific productivity," *Journal of the Washington Academy of Sciences*, vol. 16, no. 12, pp. 317–323, 1926.
- [17] P. S. Nagpaul, "Citation analysis of doctoral theses in social sciences," *Scientometrics*, vol. 41, no. 1–2, pp. 101–109, 1998.
- [18] R. Amsaveni and N. Muthusami, "Citation analysis of doctoral dissertations in agriculture," *International Journal of Information Dissemination and Technology*, vol. 4, no. 2, pp. 149–153, 2014.
- [19] B. M. Gupta, "Bibliometric analysis of research output in Agriculture Sciences in India during 2002–2011," *IASSI Quarterly*, vol. 31, no. 1, pp. 1–19, 2012.
- [20] K. Saravanan and A. Dominic, "Citation analysis of Indian Journal of Agricultural Sciences," *Library Progress (International)*, vol. 32, no. 2, pp. 151–160, 2012.
- [21] M. Thangaraj and V. S. Kataria, "Citation pattern of doctoral theses in agricultural universities," *Pearl: A Journal of Library and Information Science*, vol. 8, no. 3, pp. 133–141, 2014.
- [22] N. Koganuramath, D. Angadi, and A. P. Kademani, "Bibliometric dimension of innovation communication in organic chemistry," *Malaysian Journal of Library and Information Science*, vol. 7, no. 1, pp. 83–97, 2002.
- [23] S. K. Chadha, "Citation studies in Indian agricultural libraries," *Herald of Library Science*, vol. 38, no. 3–4, pp. 211–218, 1999.
- [24] P. Murugan and M. Venkatesan, "Citation analysis of dissertations of Tamilnadu Agricultural University," *International Journal of Library Science*, vol. 2, no. 4, pp. 55–62, 2013.
- [25] S. Dutta, "Half-life of literature in agriculture: A bibliometric approach," *Annals of Library and Information Studies*, vol. 57, no. 1, pp. 55–61, 2010.
- [26] H. Falagas et al., "Comparison of PubMed, Scopus, Web of Science, and Google Scholar: Strengths and weaknesses," *FASEB Journal*, vol. 22, no. 2, pp. 338–342, 2008.
- [27] ICAR, Indian Council of Agricultural Research: Annual Report 2021-22. New Delhi: ICAR, 2022.

[28] UGC, Minimum Standards and Procedures for Award of M.Phil/Ph.D. Degree, Regulations 2016 (Amended 2018). New Delhi: University Grants Commission, 2018.

[29] M. Nisha and H. Jange, "Scholarly communication and citation patterns in Indian agricultural journals," DESIDOC Journal of Library and Information Technology, vol. 36, no. 2, pp. 91–97, 2016.

[30] S. Padhi and S. Panda, "Citation analysis of Indian agriculture research: A bibliometric study," Library Management, vol. 41, no. 6–7, pp. 409–419, 2020.

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