Citation analysis of Post Graduate Theses submitted to Department of Renewable Energy Sources in College of Agricultural Engineering and Technology, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra

Abstract: Citation analysis helps to understand the different ways that users look for material. Citation analysis can be used to calculate the obsolescence rate. Finding the rate of obsolescence of publications in the field of renewable energy sources is the aim of this study. Citation analysis is being done on M.Tech. (Agril.Engg.) PG theses that were submitted to the College of Agricultural Engineering and Technology's department of Renewable Energy Sources. This college is a constituent college of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, located in Dapoli, in the district of Ratnagiri, Maharashtra, India. The study uses theses that were submitted between 2017 and 2021. There are 14 theses in total, with 707 citations. Analysis is also conducted to determine the Authorship pattern and Types of Information Sources that the researchers mentioned in their theses.

Key Words: Citation Analysis, Obsolescence study, Authorship study

Introduction

Analysing citations is a worthwhile undertaking. "Citation analysis" describes how one text cites another text and provides information on how to locate the referenced text. Citation analysis can help with understanding publication trends, author effectiveness, subject relationships, and more. The first citation analysis to determine which journals to subscribe to and which back volumes to buy for Pomona College's library was done[1, 2]. They looked at how frequently the Journal of the American Chemical Society's references were cited[3].

Citation analysis enables you to examine and evaluate the citations that articles, authors, organisations, and other markers of scientific activity have received[4]. You can also discover more about your users with the aid of citation analysis. The most often used and valued sources in your students' papers and faculty publications can be determined by looking at the kinds of sources that are most valued and used locally[5]. A crucial component of scientific communication is the use of bibliographic references[6]. One of the most common subjects of bibliometric study is citation analysis. Citation analysis employs a variety of techniques to establish connections between authors or work [7].

Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra was established on 18/05/1972 and College of Agricultural Engineering and Technology, Dapoli, a constituent college was established on 03/07/1998. Here onwards following abbreviations will be used alternatively:

DBSKKV : Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra

CAET: College of Agricultural Engineering and Technology, Dapoli, Dist. Ratnagiri, Maharashtra (a constituent college of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli

RES : Department of Renewable Energy Sources

This study is carried out to know the research output of RES of CAET, various forms of information sources approached by researchers of RES of CAET, age of the sources approached by the researchers of RES of CAET, the authorship pattern of the sources approached by the researchers of RES of CAET, the Obsolescence rate of RES Journals.

Scope: The present study is to derive the obsolescence rate of publications in the field of RES. The methodology opted is Citation Analysis of Master degree theses submitted to the RES of CAET. The duration isfrom 2017 to 2021 and the total number of theses is 14, having 707 citations.

Methodology: The data for the study were collected from the theses submitted to M.Tech. (Agril. Engineering) in RES department of CAET. The title page and the references given at the end of the theses were photocopied. The demographic details of M.Tech.(Agril. Engineering) Theses and the citations were entered in MS-Excel. Unique identification number was given to each thesis and its correspondingcitations. The data entered in MS-Excel was analyzed by the structure of the subject, distribution of documents by authorcharacteristics and document characteristics to meet the objectives of the study. The interpretation of data findings of study is recorded.

Previous Studies: A bibliometric analysis of 27 doctoral dissertations in Mathematics was conducted using a database management software tool. A normalised ranking of journals with corrected citation numbers, a correlation study, and bibliographic forms of literature were presented[8]. A study of 65 library and information science dissertations submitted to Nagpur University (India) between 1990 and 1994 revealed that the majority of the dissertations focused on trends in different areas of library and information science and literature reviews[9]. A bibliometric analysis comprised 27 dissertations in the field of library and information science and 6,257 citations overall. College and Research Libraries is the most cited journal, with Scientometrics coming in second. Fifty-five of the total citations come from journals. A total of 16976 citations are included in 92 theses. Researchers often look into the formats, authorship patterns, and temporal distribution of the information resources they cite in their theses[10]. Citation analysis is a helpful method for ascertaining how customers look for information to meet their demands. One can also ascertain the rate of publication obsolescence by citation analysis[11]. Doctoral dissertations from the Ohio State University Chemistry Department between 1996 and 2000 were review and it was concluded that the great majority of citations are for papers published in scientific journals, as only 12 publications are needed to cover 50% of the resources[12]. In order to determine which journals were most frequently referred and the relationship between monographs and articles in scientific journals, the citations in dissertations on education sciences that were finished between 2000 and 2002 were examined. The reference lists of forty-three education dissertations on curriculum and instruction that were finished at the University of Minnesota between 2000 and 2002 were assessed in order to aid in the construction of the collection. Additionally, the citation ratio for serial monographs was examined in relation to funding ratios and contrasted with other research[13].

Citation analysis helps find out users' approaches in finding information for their intended use. Through citation analysis, an obsolescence rate can be achieved. This article documents the obsolescence rate of publications, authorship pattern, chronological distribution of journal articles, information sources cited by the researchers in the field of Meat, Poultry, and Fish post harvest management were studied[14]. The primary objective of Khandare & Sonwane`s research (2021) is to investigate the application of Bradford's Law of Scattering and the Leimkuhler model in citations from Ph. D. theses in Economics from Dr. theses in Economics from 1967 to 2017 provided the data. theses generated a total of 30,611 citations. Of the total 30611 citations, 7750 are from journals. Bradford's law of scattering is thus not technically fit by the relationship between the zones and the data, but it is verbally fit[15]. The periodical rankings in a study were evaluated using the citation analysis technique. Using the ranking table, the study`s results were cross-checked against the periodicals collection of the host library. The study looked at citations from 1976 to 2017 in library and information science PhD theses that were submitted to Panjab University in Chandigarh. 10961 citations from 63 PhD theses in Library and Information science constitute the basis of the study. The

study cites single-authored citations. Journal articles make up 55.10 percent of all citations, while citations make up 72.92 percent of all citations[16]. Citation analysis helps to understand the different ways that users look for material. Citation analysis can be used to calculate the obsolescence rate. The purpose of this research is to ascertain the rate of obsolescence of post-harvest management and post-harvest engineering publications. The Post Graduate Institute of Post Harvest Management, Killa-Roha, Dist. Raigad, a constituent college of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist. Ratnagiri, Maharashtra, is receiving master's degree theses, and citation analysis of those theses is being done. The analysis uses theses that were turned in between 2018 and 2020. In all, 14 theses have been produced, with 2155 citations. Analysis is also done to find out the Forms of the Information sources referred by the researchers in their theses, Chronological distribution of citations and Authorship Pattern[17]. The study includes 28 doctoral theses that were turned in between 1995 and 2018. According to the report, 2016 was the most productive year, and male research scholars contributed more than female research academics did. Professor K. L. Mahawar has overseen the most number of theses—14, or 50% of all—under his direction. The vast majority of references are journal articles written by one person. The most often cited journal is Library Philosophy and Practice (e-journal). The subdomain of LIS that has been studied the most is development and information seeking behaviour. Numerous countries have carried out bibliometric studies on PhD theses in a variety of fields; however, an examination of the published literature reveals that India has made relatively few attempts to date, particularly in the field of library and information science[18]. A study examines 28 doctoral theses that were turned in between 1995 and 2018. With 14 theses under his supervision, or 50% of the total, Prof. Numerous countries and fields have conducted bibliometric research on PhD theses; however, an examination of the published literature indicates that India has only made a few attempts, particularly those in the Library and Information Science domain. The study may be helpful to academics, researchers, and librarians in identifying bibliographic attributes[19].

Results & Analysis:

Research Output from Department of Renewable Energy Sources of College of Agricultural Engineering & Technology, Dapoli:

Table 1 reveals the rate of Master Degree Awards or research output from Department of RES of CAET, Dapoli. The whole time span is from 2017 to 2021. The highest Master degrees are awarded in the year 2017, 2018, 2019, and 2021 and it is 3 each out of total 14 i.e., 21.43% ranking the first. In the year 2020, 2 Theses are submitted which is 14.29% standing on the 2nd rank.The table 1 also contains data of number of citations added to the theses and average number of citations per thesis. The average number of citations added in the year 2021 per thesis is 172 / 707 i.e., 24.33%, the first rank. In the year 2019, average number of citations added is 143 / 707 i.e., 20.23% posing the 2nd rank. The average number of citations added per thesis in the year 2017 is 142 / 707 i.e., 20.08%, which is in the 3rd rank.

Table 1: Year wise Distribution of M.Tech. Theses in Renewable Energy Sources

SN	Year	No. of Theses	Percentage	Ranking	No. of Citations	Avg. No. of Citations per thesis	Ranking
1	2017	3	21.43	1	142	20.08	3
2	2018	3	21.43	1	133	18.81	4
3	2019	3	21.43	1	143	20.23	2

4	2020	2	14.29	2	117	16.55	5
5	2021	3	21.43	1	172	24.33	1
		14	100.00		707	100.00	

Form wise Distribution of Citations:

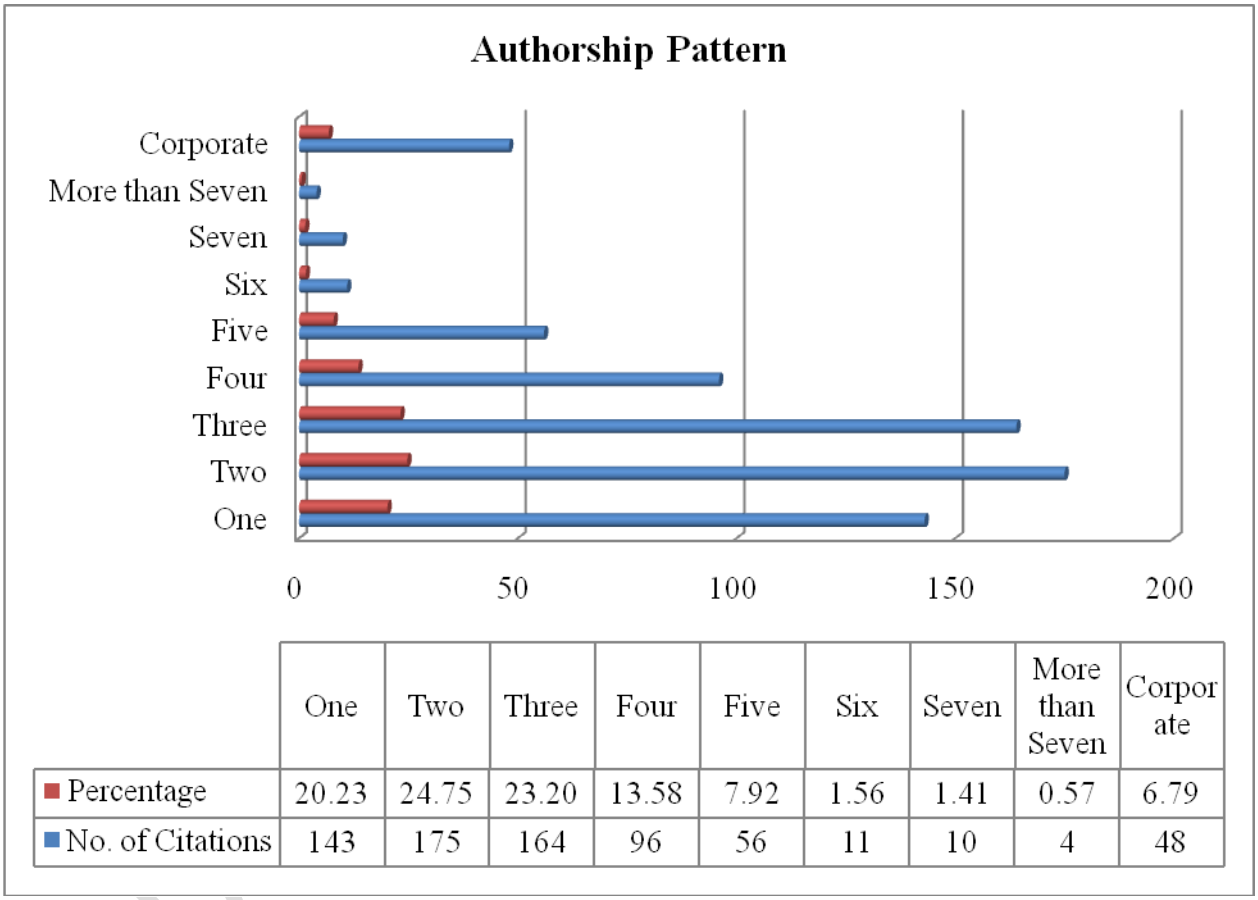
M.Tech. (Agril. Engineering) students of RES department approached wide variety of information sources for their research. The various types of resources and number of citations are given in the following Table 2. The data reveals that researchers cited the journal / periodical articles most frequently. There are 530 journal article citations among 707 – the 1st rank and 29 Book citations – the 2nd rank and , 27 Conference Paper and 27 Web Page citations among 707 citations – the 3rd rank.

Table 2: Form wise Distribution of Citations

SN	Type of Resource	No. of Citations	Percentage	Ranking
1	Journal Article	530	74.96	1
2	Book	29	4.10	2
3	Conference paper	27	3.82	3
4	Web page	27	3.82	3
5	Thesis	25	3.54	4
6	Report	15	2.12	5
7	Manual	14	1.98	8
8	Standards - Test code & procedure	8	1.13	9
9	Book Chapter	5	0.71	10
10	Hand book	5	0.71	10
11	Field Document	3	0.42	11
12	Dissertation	2	0.28	12
13	Lab manual	2	0.28	12
14	Manual (unpublished)	2	0.28	12
15	Report (Test)	2	0.28	12
16	Yearbook	1	0.14	13
17	GI	1	0.14	13
18	Guide book	1	0.14	13
19	Handout	1	0.14	13
20	Booklet	1	0.14	13
21	Newsletter	1	0.14	13
22	Report (Project)	1	0.14	13
23	Database	1	0.14	13
24	Seminar paper	1	0.14	13
25	Software	1	0.14	13
26	Technical bulletin	1	0.14	13

SN	Type of Resource	No. of Citations	Percentage	Ranking
		707	100.00	

Authorship pattern: Authorship pattern is the study of cited publications is prepared by single author? Or multiple authors? The following Graph shows that the researchers believe in collaboration. Only 20.23% (143/707) literature cited is single authored, which is third place of ranking. Double authored citations rank first. It shares 24.75% (175 /707). Three authors is in second place of ranking which shares 23.20% (164/707) of citations. Some publications found authored by more than eight, nine or ten, but they are counted in the 'More than Seven' authors category. The publications published by name of institution / organization / company is categorized as 'Corporate authorship'. There are 6.79% (48/707) citations ranking 6th in the 'Corporate authorship' category.



	One	Two	Three	Four	Five	Six	Seven	More than Seven	Corporate
Percentage	20.23	24.75	23.20	13.58	7.92	1.56	1.41	0.57	6.79
No. of Citations	143	175	164	96	56	11	10	4	48

Fig 1: Authorship Pattern

Chronological Distribution of Citations: Table 3 describes the chronological distribution of citations. The data reveals that the researchers referred recent publications for their research. From the data, the highest citations is 386/707 i.e., 54.60% of citations are published in the duration2011-2021.The usage of publications is declined as it becomes old. The publications which are published in the years 1961-1970 are rarely used, and their usage is 9/707 i.e., 1.27% ranking 6th position.

Table 3: Chronological Distribution of Citations

SN	Year	No. of Citations	Percentage	Ranking
1	1961-1970	9	1.27	6
2	1971-1980	12	1.70	5
3	1981-1990	29	4.10	4
4	1991-2000	72	10.18	3
5	2001-2010	199	28.15	2
6	2011-2021	386	54.60	1
		707	100.00	

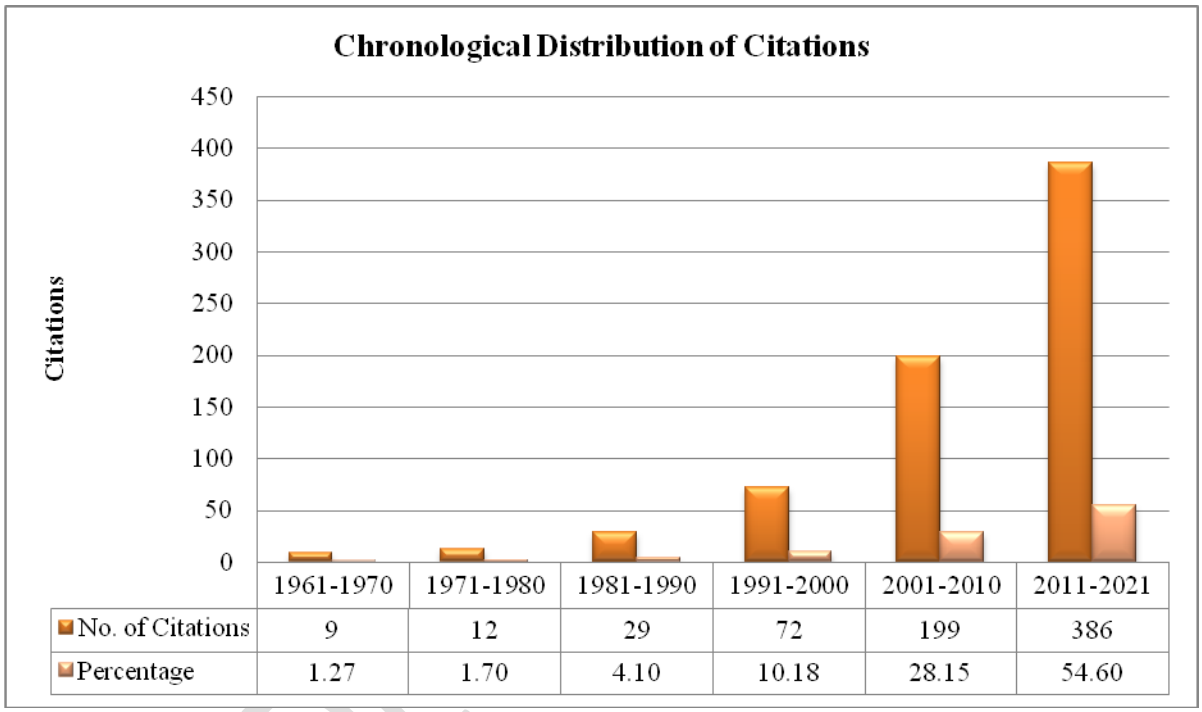


Fig 2: : Chronological Distribution of Citations

Obsolescence Study:

Obsolescence study or Age study of publications is one of the common observation in citation analysis. It describes the decline in usage of publication or citations over a period of time. Table 4 represents the obsolescence of journals and book citations. The complete 707 citations are divided into 6 time spans having 10 years of length.

Table 4: Obsolescence Study

SN	Age of Citation	No. of Citations	Percentage
1	0-9	435	61.53
2	10-19	161	22.77

SN	Age of Citation	No. of Citations	Percentage
3	20-29	66	9.34
4	30-39	29	4.10
5	40-49	9	1.27
6	50-59	7	0.99
		707	100.00

The data gathered shows that 662/707 = 93.64% of citations come under the age group 0 to 29. The remaining 6.36% of citations come under the age group 30 to 60 years. This proves that there is considerable decline in usage of publication when it gets old.

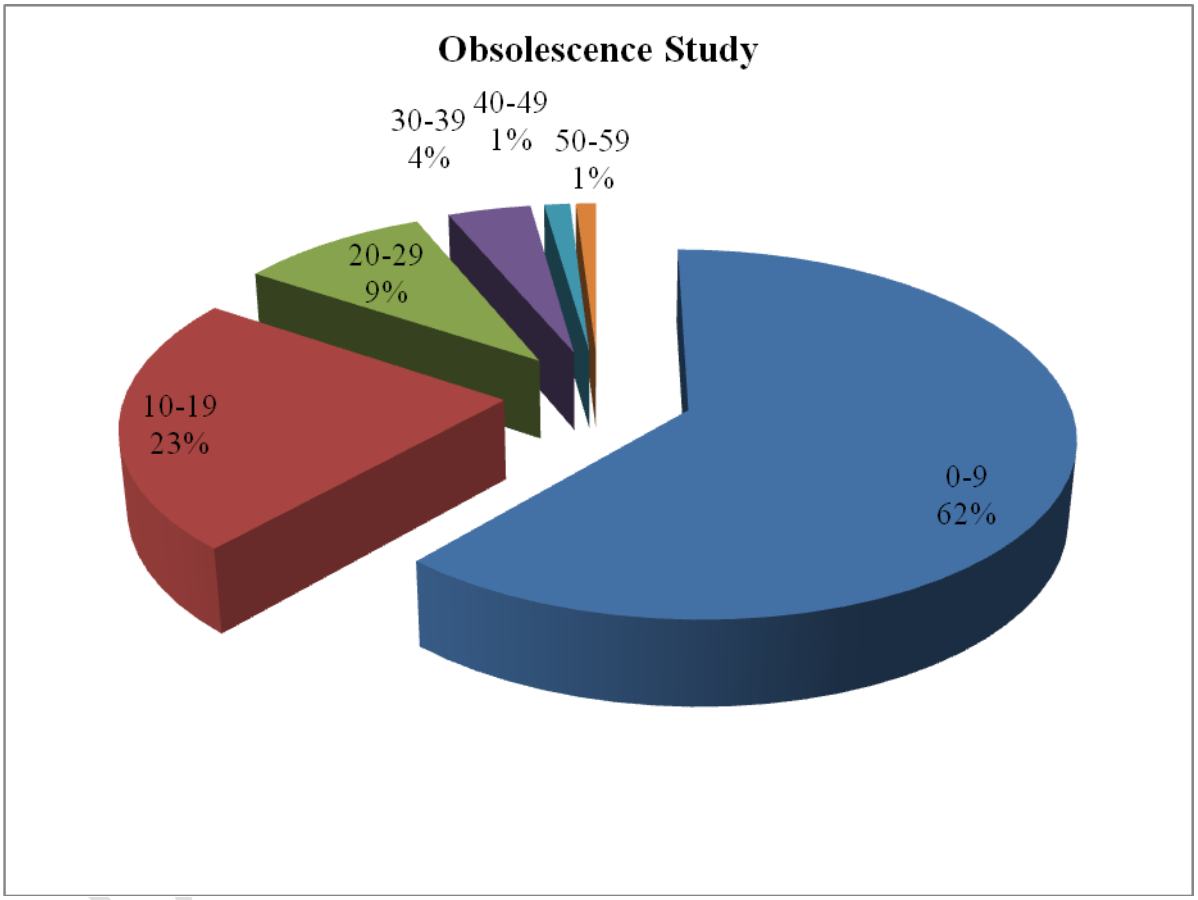


Fig 3: Obsolescence Study

Ranked List of Journals: Journalsare necessary for research but their rising costs necessitate a review of their quality, utility and suitability for specificgroup of users by librarians. The ranking list is a useful tool for determining which journals are most useful in terms of theircoverage of fresh and important work in a given area. The ranked list of journals in the field of RES is presented in Table No. 5. Journals cited more than twice appear in the table. Titles are arranged in theirdecreasing order of citations

Table 5: Ranked List of Journals

SN	Journal Name	Rank	Citations	Percent	Cumulative	
					Citations	Percent
1	Energy Conversion & Management	1	25	4.73	25	4.73
2	Solar energy	2	24	4.55	49	9.28
3	Biomass & Bioenergy	3	23	4.36	72	13.64
4	International journal of current microbiology & applied science	4	20	3.79	92	17.42
5	Desalination	4	20	3.79	112	21.21
6	International journal of agricultural engineering	5	19	3.60	131	24.81
7	Misr. Journal of Agricultural Engineering	6	12	2.27	143	27.08
8	Renewable energy	6	12	2.27	155	29.36
9	Energy Procedia	7	11	2.08	166	31.44
10	Agricultural Engineering Today	8	10	1.89	176	33.33
11	Journal of Agricultural Engineering Research	9	6	1.14	182	34.47
12	Journal of food engineering	9	6	1.14	188	35.61
13	Assumption University Journal of Technology	9	6	1.14	194	36.74
14	Energy for sustainable Development	9	6	1.14	200	37.88
15	European Journal of Sustainable Development	9	6	1.14	206	39.02
16	Journal of Agricultural Engineering	10	5	0.95	211	39.96
17	African journal of Environmental Science & Technology	10	5	0.95	216	40.91
18	American Journal of Engineering Research (AJER)	10	5	0.95	221	41.86
19	Energy	10	5	0.95	226	42.80
20	International Journal of Energy Engineering	10	5	0.95	231	43.75
21	International journal of engineering, research & technology	10	5	0.95	236	44.70
22	International journal of innovative research in science, engineering & technology	10	5	0.95	241	45.64

SN	Journal Name	Rank	Citations	Percent	Cumulative	
					Citations	Percent
23	International Journal of Innovative Science, Engineering & Technology	10	5	0.95	246	46.59
24	International journal of latest engineering research & applications	10	5	0.95	251	47.54
25	International Journal of Scientific & Research Publications	11	4	0.76	255	48.30
26	Journal of Scientific & Industrial Research	11	4	0.76	259	49.05
27	Sadhana - - AcademyProceedings in Engineering Sciences	11	4	0.76	263	49.81
28	World Applied Sciences Journal	11	4	0.76	267	50.57
29	Agricultural engineering international: CIGR journal	11	4	0.76	271	51.33
30	Agricultural mechanization in Asia, Africa & Latin America	11	4	0.76	275	52.08
31	Annual Reviews in Energy & Environment	11	4	0.76	279	52.84
32	Applied Entomology and Zoology	11	4	0.76	283	53.60
33	Applied Science Reports	12	3	0.57	286	54.17
34	BIOINFO Renewable & Sustainable Energy	12	3	0.57	289	54.73
35	Biomass	12	3	0.57	292	55.30
36	Biomass conversion &Biorefinery	12	3	0.57	295	55.87
37	Bioresource Technology	12	3	0.57	298	56.44
38	Combustion Science & Technology	12	3	0.57	301	57.01
39	Dairy Science & Technology	12	3	0.57	304	57.58
40	European journal of entomology	12	3	0.57	307	58.14
41	Global Journal of Advanced Research (GJAR)	12	3	0.57	310	58.71
42	Global journal of science frontier research	12	3	0.57	313	59.28
43	Indian Journal of Dairy Science	12	3	0.57	316	59.85
44	Indian Journal of Scientific Research (IJSR)	12	3	0.57	319	60.42
45	International Journal of Advance Research & Innovation	12	3	0.57	322	60.98
46	International Journal of Advanced Research	12	3	0.57	325	61.55

SN	Journal Name	Rank	Citations	Percent	Cumulative	
					Citations	Percent
47	International journal of agricultural science & research	12	3	0.57	328	62.12
48	International Journal of Mechanical Engineering and Technology	12	3	0.57	331	62.69
49	International Journal of Renewable Energy & Environmental Engineering (IJEEE)	12	3	0.57	334	63.26
50	International journal of science & research (IJSR)	12	3	0.57	337	63.83
51	International research journal of engineering & technology	12	3	0.57	340	64.39
52	ISRN Renewable energy	12	3	0.57	343	64.96
53	IOSR journal of applied physics	12	3	0.57	346	65.53
54	IOSR Journal of engineering	12	3	0.57	349	66.10
55	Journal of Cleaner Production	12	3	0.57	352	66.67
84	Apart from above 55journals other 29 Journals have two citations (Separate names not included in this list)	13	58	10.98	410	77.65
202	Apart from above 55 + 29 =84, 118 Journals have one citation (Separate names notincluded in this list)	14	118	22.35	528	100.00
			528	100.00		

Table 5 reveals that the most cited journal by RES scholars is Energy Conversion & Management, which was cited 25 times, more than 4.73% of the total percentage of citations, followed by Solar energy, at 24 times(4.55%), Biomass & Bioenergy, 23times (4.36%), International journal of current microbiology & applied science, 20times (3.79%), Desalination, 20(3.79%), International journal of agricultural engineering, 19 times (3.60%), Misr. Journal of Agricultural Engineering, 12 (2.27%),Renewable energy, 12 times (2.27%), Energy Procedia, 11 times (2.08%), Agricultural Engineering Today, 10 times,(1.89%).

Bradford's Law of Scattering: Bradford's law is a pattern first described by Samuel C. Bradford in 1934 that estimates the exponentially diminishing returns of searching for references in science journals.

"If the journals containing articles on a given subject are arranged in the descending order of the number of articles they carried on the subject, then successive zones of periodicals containing the same number of articles on the subject form the simple geometric series 1: n : n^2 : n^3", and Bradford called the first zone, the nucleus of periodicals particularly devoted to the given subject. (G. Alabi, 1979)

In the present study, 11 journals covered 182citations, the next 44 journals covered 167citations, and the next 147 journals covered 179citations. That is, 11 journals covered approximately one-third of the total citations, the next 44 journals accounted for another approximately one-third, andthe final 147 covered approximately the remaining one third.Thus, the first zone or 'nucleus' contains 11 journals, followed by the second zone with 44, and the third with 147 journals. Thezones form an approximately geometric series in the form.11 :44 : 147
Here, 44 = 11 X 4and 176 = 11 X 4 X 5

i.e. 11 : 11 X 4 : 11 X 4 X 4or 11: 11 X 4 : 11 X 4^2

Substituting 4 = n11 : 11 X n : 11 X n^2i.e. 1 : n : n2Where 11 represents the number of journals in the nucleus and n=4 is a multiplier.

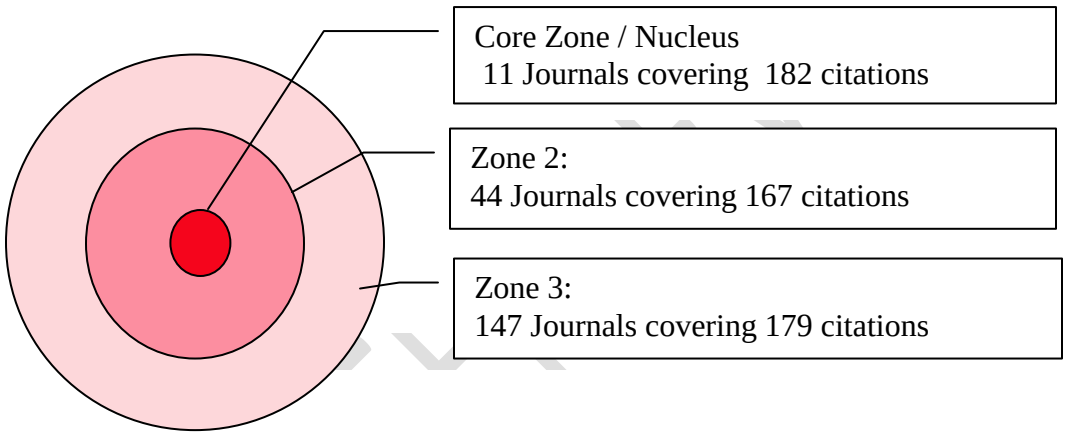


Fig 4: Bradford's Law of Scattering

Geographic Distribution Citation analysis by country provides data on the countries that are active in a subject field and their respective contribution. Table shows the geographical distribution of ranked journals.

Table 6: Geographic Distribution

Country	Journals	Percentage
India	69	34.16
UK	41	20.30
USA	35	17.33
China	32	15.84
Iran	11	5.45
Italy	2	0.99
Japan	2	0.99
Netherlands	2	0.99
Africa	1	0.50
Belgium	1	0.50

Czech	1	0.50
Egypt	1	0.50
Germany	1	0.50
Pakistan	1	0.50
Switzerland	1	0.50
Thailand	1	0.50
	202	100.00

Publisher Distribution: The sort of organization that publishes information can influence the decision to acquire the library materials. To learn moreabout the publishers cited in RES theses, publishers were categorized ascommercial, academic, association, societies, individuals, and government. Chart shows the publisher distribution of 202 journals.

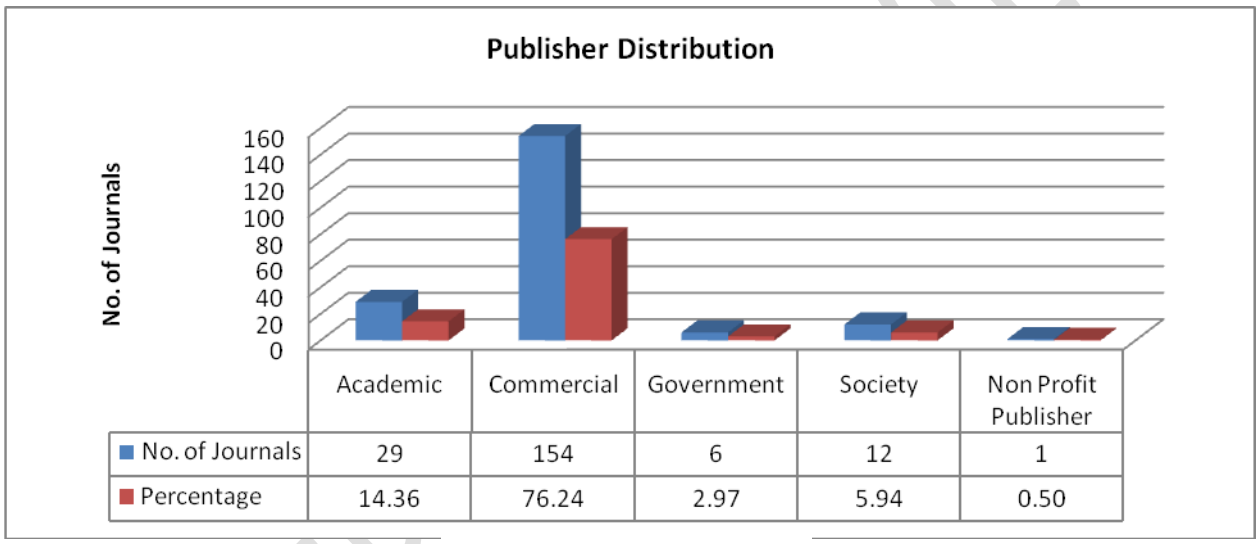


Fig 5: Publisher Distribution

Findings and Conclusion:

Citation Analysis is one of the tools bibliometric / scientometric / informetrics studies. The application of citation analysis inlibraries will be used in collection management. The citation counting will help in procuring the books, periodicals and also in write off process. It is found from the study that

1.Researchers of RES cited Journal articles most frequently. The74.96% of total citation i.e., 530 / 707 are the Journal Articles. The Books are ranked the 2nd with 29 / 707 = 4.10% of citations. And Conference papers and Web pages are ranked the 3rd each with 27/ 707 = 3.82% of citations. Researchers also citedManuals, Patents, Standards, Doctoral Dissertations, Master degree theses, Reportsetc. for their study.

2. From citations cited in RES M. Tech. (Agril. Engineering) theses, it's observed that the studies or literary work is done withcollaboration. The 143/707 = 20.23% citations are single authored.

While, 48/707 = 6.79 % citations are corporateauthored. The remaining 72.98% of citations are multiple authored i.e., two or more number of authors.

3. Obsolescence studies aid in the weeding out of obsolete, outdated materials which makes the place for the new purchasesand avoids noise in the information retrieval.

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