

Mapping of Agriculture Universality research output in South India: A Scientometric Analysis

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Abstract

Scientometric study is a great potential to given valuable insights into the evolution of the research on Agricultural University research. The present study explores the characteristics of the research output on the Agricultural University research output in South India. and published during the last 4 decades based on the Web of Science Database together with the underlying incentive structures and its implications using the Scienotmetric techniques. The results of this study reveal that the research output Agricultural Universities in South India during this period 1989-2018. Agricultural research publications are indexed in Web of Science database and the study is found 5111. The study measures the performance based on several parameters, Year wise Publications, doubling time, exponential growth rate, growth pattern, etc. Further, the study examines number of author growth pattern,

Keyword: *Scientometric Analysis ; Agricultural University, South India;*

1. INTRODUCTION

Bibliometrics provides powerful tools for the evaluation of research publication of Academic Institutions. The application of bibliometric method to research in disciplinary areas in which consensus is reached has become almost routine. Bibliometric studies are used to identify the pattern of publications, authorship, citations and journal coverage with the hope to give an insight in to the dynamics of the field under consideration (Warraich, 2011). This study utilizes quantitative analysis and statistics to describe year wise distribution of articles, patterns of authors, average number of citations per article and so on. So, since the last 5 decades, globally it is being recognized as the thrust area of research in the field of Library and Information Science. In the year 1969, Allan Pritchard first described the term bibliometrics as the application of mathematics and statistical methods to books and other media. (Surulinathi, M., Balasubramani, R., & Kalisdha, A. 2013).

2. DATA COLLECTION

For collecting the publication metadata, the renown Web of Science (WoS) was used which covers a selected group of journals and conferences. The data was collected for the period 1989-2018. The 30 years period is a good period for detailed analytical purpose. (Raja, S., &

Balasubramani, R. 2011). The query used for the collection of data was: [OG = "Agriculture University" Timespan=1989 - 2018, Indexes =SCI-EXPANDED, SSCI, A & HCI].The data was obtained in December 2018. There are different types of record such as article, proceedings paper, book review, note, review, meeting abstract, letter, editorial material etc. Each record in WoS consists of 61 fields including meta-data about the records, such as paper title, author address, citation references etc. (Abu, K. S., & Balasubramani, R. 2015).

3. METHODOLOGY

The standard Scientometric methodology was followed to compute various parameters like Year Wise Distribution, doubling time, exponential growth rate, growth pattern, Average Citation Per Paper (ACPP), Cited Percentage (CP), Total Local Citation Score and Total Global Citation Score. (Sivaraman, P., Sivaram, S., & Surulinathi, M. 2007).

4. OBJECTIVE

The major objectives are framed with the exclusive notion of the present study as mentioned below:

1. To examine the growth of research productivity of Agriculture Universities in South India research during 1989- 2018.
2. To identify the doubling time in number of publication wise during the period of 1989-2018

5. ANALYSIS

Table 1 Yearly wise distribution of the publication

S.No.	Publication Year	Records	Percent	TLCS	TGCS	ACPP
1	1989	20	0.4	1	42	2.10
2	1990	15	0.3	3	300	20.00
3	1991	50	1.0	8	659	13.18
4	1992	73	1.4	15	575	7.88
5	1993	57	1.1	10	975	17.11
6	1994	53	1.0	5	601	11.34
7	1995	53	1.0	16	714	13.47
8	1996	60	1.2	9	782	13.03
9	1997	61	1.2	10	777	12.74
10	1998	74	1.4	12	1562	21.11
11	1999	77	1.5	26	2540	32.99
12	2000	100	2.0	13	1397	13.97
13	2001	111	2.2	13	2273	20.48
14	2002	68	1.3	12	792	11.65
15	2003	103	2.0	26	2638	25.61
16	2004	105	2.1	25	2186	20.82
17	2005	106	2.1	26	3162	29.83
18	2006	139	2.7	48	2327	16.74
19	2007	155	3.0	57	1932	12.46

20	2008	228	4.5	94	3621	15.88
21	2009	252	4.9	83	2645	10.50
22	2010	275	5.4	104	2658	9.67
23	2011	307	6.0	83	2338	7.62
24	2012	330	6.5	95	2363	7.16
25	2013	302	5.9	74	1804	5.97
26	2014	290	5.7	54	1695	5.84
27	2015	374	7.3	53	1237	3.31
28	2016	394	7.7	29	987	2.51
29	2017	504	9.9	12	561	1.11
30	2018	375	7.3	7	139	0.37
	Total	5111	100	1023	46282	9.06

***TLCS – Total Local Citation Score ** TGCS – Total Global Citation Score**

The table depicts the research output in the global level. From the above table, It could clearly see that during the period 1989 – 2018 a total of 5111 publications were published. In the present study the research output on Agricultural Universities in South India publication is taken as a tool to evaluate the performance at various levels. The growth pattern of Agricultural University is calculated using the standard methods and formulae described in the methodology of this study.

Table 1 also calculated the average citations per paper. These papers have together received an average of 9.06 citations per paper for the total papers. The highest average citation is 32.99 citation in 1999, 29.83 citation in 2004, 25.61 citation in 2003, 21.11 citation in 1998, 20.82 citation in 2004 and 20.48 citation in 2001 as well as follows.

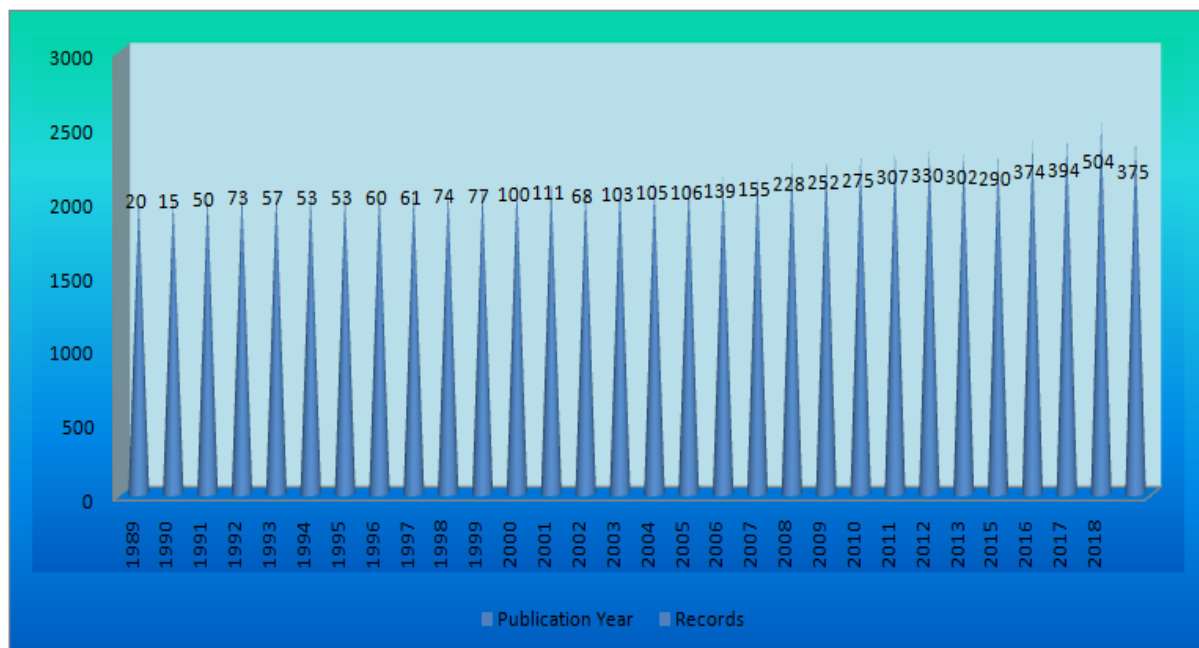


Figure 1. Yearly wise distribution of the publication

Figure 1 shows that the Year wise distribution of the publications. It's divided into two categories. One is X category (year wise distribution of the publications) and another one is Y category (Record of the publications). The highest number of the publications in the year 207 with 504 records and second level of the distribution of the publications in the year 2016 with 394 records and rest as well as follow in the figure dot mark. This figure followed in the cone methods of the distribution of the publications.

Relative growth rate (RGR) is the measure to study the increase in number of articles of a particular period of time. Doubling time (DT) is the period of time required for a quantity to double in size or value, the year- wise growth of Agricultural University, its cumulative growth; RGR and DT are obtained from the calculation and are presented the Table 3. The highest publication is 504 in 2017 and followed by 394 papers in 2016, 375 papers in 2018 and 330 papers in 2012. The least number of publications in the years 1989 and 1990 with 20 and 15 records of the publications due to the initial stage of universities developments.

TABLE 2 SHOWING DOUBLING TIME IN NUMBER OF PUBLICATION WAS OBSERVED DURING 1989 TO 2018

#	Publication Year	Records	Log W1	Log W2	R(a)	Mean R(a) 1-2	DT	Mean Dt R(a) 1-2
1	1989	20		3.00	3.00		0.23	
2	1990	15	3.00	2.71	0.29		2.41	
3	1991	50	2.71	3.91	1.20		0.58	
4	1992	73	3.91	4.29	0.38		1.83	
5	1993	57	4.29	4.04	0.25		2.80	
6	1994	53	4.04	3.97	0.07		9.52	
7	1995	53	3.97	3.97	0.00		0.00	
8	1996	60	3.97	4.09	0.12		5.59	
9	1997	61	4.09	4.11	0.02		41.93	
10	1998	74	4.11	4.30	0.19		3.59	
11	1999	77	4.30	4.34	0.04		17.44	
12	2000	100	4.34	4.61	0.26		2.65	
13	2001	111	4.61	4.71	0.10		6.64	
14	2002	68	4.71	4.22	0.49		1.41	
15	2003	103	4.22	4.63	0.42	0.85	1.67	12.29
16	2004	105	4.63	4.65	0.02		36.03	
17	2005	106	4.65	4.66	0.01		73.11	
18	2006	139	4.66	4.93	0.27		2.56	
19	2007	155	4.93	5.04	0.11		6.36	
20	2008	228	5.04	5.43	0.39		1.80	
21	2009	252	5.43	5.53	0.10		6.92	
22	2010	275	5.53	5.62	0.09		7.93	
23	2011	307	5.62	5.73	0.11		6.30	
24	2012	330	5.73	5.80	0.07		9.59	

25	2013	302	5.80	5.71	0.09		7.82	
26	2014	290	5.71	5.67	0.04		17.09	
27	2015	374	5.67	5.92	0.25		2.72	
28	2016	394	5.92	5.98	0.05		13.30	
29	2017	504	5.98	6.22	0.25		2.81	
30	2018	375	6.22	5.93	0.29	0.27	2.37	24.59
	Total	5111				0.56		18.44

Table 3 clearly shows that doubling time in number of publication was observed during the period 1989- 2018, a total of 5111 publications, were published at global level. The highest number of publications in the year 2017 with 504 records and the following year 2016 with 394 records and doubling time in number of publication was observed Mean R(a) is 0.56 in 18.44 years. It denotes that the Doubling time is 18.44 in the research output of Agricultural Universities in South India for the study period.

The below Table 4 reveals the Exponential Growth rate of over all publications on Agricultural Universities in South India during thirty years. An exponential growth rate in number of publication was observed during 1989 to 2018. The highest growth rate (3.33 %) was found during 1991 with 50 publications followed by (1.51 %) with 103 publications during 2003, during 2008 (1.47 %) with 228 publications, at 1992 (1.46 %) with 73 publications, 1.31 percents during 2006, 1.30 percents during 2000, 1.29 percents at 2015, 1.28 percents at 2017, 1.13 percents at 1996, 1.12 percents at 2007, 1.11 percents at 2001 and 2009, 1.09 percents at 2010, 1.07 percents at 2012, 1.05 percents at 2016. 1.04 percents at 1999, 1.02 percents at 1997 and 2004.

TABLE 3 SHOWING EXPONENTIAL GROWTH RATE IN NUMBER OF PUBLICATION WAS OBSERVED DURING 1989 TO 2018

S.No.	Publication Year	Records	Exponential Growth Rate	Mean	S.D	V	C. V.
1	1989	20	0.00				
2	1990	15	0.75				
3	1991	50	3.33				
4	1992	73	1.46				
5	1993	57	0.78				
6	1994	53	0.93				
7	1995	53	1.00				
8	1996	60	1.13				
9	1997	61	1.02				
10	1998	74	1.21				
11	1999	77	1.04				
12	2000	100	1.30				
13	2001	111	1.11				
14	2002	68	0.61				
15	2003	103	1.51				

16	2004	105	1.02	2003.5	51.07	7.15	0.36
17	2005	106	1.01				
18	2006	139	1.31				
19	2007	155	1.12				
20	2008	228	1.47				
21	2009	252	1.11				
22	2010	275	1.09				
23	2011	307	1.12				
24	2012	330	1.07				
25	2013	302	0.92				
26	2014	290	0.96				
27	2015	374	1.29				
28	2016	394	1.05				
29	2017	504	1.28				
30	2018	375	0.74				
	Total	5111	33.75 (1.13)				

1.01 percents at 2005, 1.00 percents at 1995, 0.96 percents at 2014, 0.93 percents at 1994, 0.92 percents at 2013, 0.78 percents at 1993, and 0.75 percents at 1990. The average exponential growth rate is 1.13 during the sample periods. The table also calculated the value of 2002 with Mean, Standard Deviation value is 7.15, Variance is 51.07 and Co-efficient of variance is 0.36.

FIGURE 3 SHOWING EXPONENTIAL GROWTH RATE IN NUMBER OF PUBLICATION WERE OBSERVED DURING 1989 TO 2018

Figure 3 shows that the exponential growth rate of the distribution of the publications. X axis cover the record of the publications and Y axis cover the yearly wise distribution of the publications. Blue line segments in year wise distribution of the publications, Red curve is followed by the records and Dark blue curve is followed by the Exponential growth rate is also perpendicular to x axis.

Table 4 Year wise and Number of Authors in Agricultural Universities in South India

S.No.	Publication Year	Records	NA	AAPP	Productivity per Authors
1	1989	20	52	2.60	0.38
2	1990	15	36	2.40	0.42
3	1991	50	122	2.44	0.41
4	1992	73	170	2.33	0.43
5	1993	57	136	2.39	0.42
6	1994	53	133	2.51	0.40
7	1995	53	140	2.64	0.38
8	1996	60	159	2.65	0.38
9	1997	61	166	2.72	0.37
10	1998	74	224	3.03	0.33

11	1999	77	267	3.47	0.29
12	2000	100	287	2.87	0.35
13	2001	111	378	3.41	0.29
14	2002	68	216	3.18	0.31
15	2003	103	348	3.38	0.30
16	2004	105	370	3.52	0.28
17	2005	106	325	3.07	0.33
18	2006	139	462	3.32	0.30
19	2007	155	543	3.50	0.29
20	2008	228	892	3.91	0.26
21	2009	252	984	3.90	0.26
22	2010	275	1211	4.40	0.23
23	2011	307	1244	4.05	0.25
24	2012	330	1465	4.44	0.23
25	2013	302	1251	4.14	0.24
26	2014	290	1331	4.59	0.22
27	2015	374	1538	4.11	0.24
28	2016	394	1690	4.29	0.23
29	2017	504	2089	4.14	0.24
30	2018	375	1687	4.50	0.22
	Total	5111		3.90	0.26

Table 5 shows that in their paper published in bibliometrics journal have given a formula to calculate Average Author Per Paper (AAPP) and Productivity Per

Author. The formula is mathematically represented as below:

Average Author per Paper = No. of Authors/No. of Papers

Productivity per Author = No. of Papers/No. of Authors

Table 5 depicts the data pertaining to author productivity and average author per paper. It is revealed from Table 5 that the average number of authors per article is 3.90 for 5111 articles published between the period 1989- 2018. It is also clear from above Table 5 the highest average number of authors per article is 4.59 with 1331 authors out of 290 records in the year 2014, 4.50 with 1687 authors out of 375 articles in the year 2018, 4.44 with 1465 authors out of 330 articles in the year 2014, 4.40 with 1211 authors out of 275 articles in the year 2010, 4.29 with 1690 authors out of 394 articles in the year 2016 and the following average number of article is 4.14 with 2089 authors out of 330 articles respectively. The average productivity per author for the period 1989-2018 is 0.26. The years 1992, 1990-93 and 1991 have recorded productivity per author i.e., 0.43, 0.42 and 0.41 respectively.

Table 7 showing growth pattern of Agricultural Universities in South India

S.No.	Publication Year	Records	Multiple factors	D ²	Trend Values YT
1	1989	20	-300	225	-24.78
2	1990	15	-210	196	-11.77
3	1991	50	-650	169	1.24

4	1992	73	-876	144	14.25
5	1993	57	-627	121	27.26
6	1994	53	-530	100	40.27
7	1995	53	-477	81	53.28
8	1996	60	-480	64	66.29
9	1997	61	-427	49	79.3
10	1998	74	-444	36	92.31
11	1999	77	-385	25	105.32
12	2000	100	-400	16	118.33
13	2001	111	-333	9	131.34
14	2002	68	-136	4	144.35
15	2003	103	-103	1	157.36
16	2004	105	0	0	170.37
17	2005	106	106	1	183.38
18	2006	139	278	4	196.39
19	2007	155	465	9	209.4
20	2008	228	912	16	222.41
21	2009	252	1260	25	235.42
22	2010	275	1650	36	248.43
23	2011	307	2149	49	261.44
24	2012	330	2640	64	274.45
25	2013	302	2718	81	287.46
26	2014	290	2900	100	300.47
27	2015	374	4114	121	313.48
28	2016	394	4728	144	326.49
29	2017	504	6552	169	339.5
30	2018	375	5250	196	352.51
	Total	5111	29344	2255	

The straight line trend is represented by the mathematical equation,

$$Y_t = a + bx$$

Y_t = required trend value
 X = unit of time

a and b are constants or unknown values. These values are calculated by the following two normal equations.

$$\begin{aligned} \Sigma Y &= Na + b \Sigma x \\ \Sigma XY &= a \Sigma x + b \Sigma x^2 \end{aligned}$$

For the year 2015, $x = 2015 - 2004 = 11$

$$Y_t = 170.37 + 13.01(11) = 313.48$$

Similarly for the year 2020, $x = 2020 - 2004 = 16$

$$Y_t = 170.37 + 13.01(16) = 378.53$$

Table shows that the growth pattern of Agricultural Universities in South India is calculated using the standard methods and formulae described in the methodology of this study. The year wise literature growth shows increasing trend level as in the case of Agricultural Universities in South India till it increased steadily to 352.51 in 2018 and the future year 2020 trend values 378.53. So the increasing level trend values are the publication of the records.

6. CONCLUSION

The study presents result of a detailed scientometric analysis of Agriculture Universities in South India research publications during the period 1989-2018. The publications indexed in WoS have been analyzed and different scientometric indicators were computed. The analytical results obtained present a detailed account of progress and status of research at Agricultural Universities in South India. The results may be useful for prospective students, researchers and research policy makers in the institution and other related organizations.

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