# Research Productivity of Universities in Kerala: Growth and Trends

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*Abstract*

*The study aims to understand the growth of scholarly literature produced by the Universities in Kerala.  The study has attempted to understand the top ranking university, major research area, prolific authors, top publications, most productive year etc. The data for the study was collected from the SCOPUS database of Elsevier.  Though there are 15 universities in Kerala, the study is limited to six state universities. The findings of the study revealed a total number of 11764 documents. CUSAT is the top ranking university in Kerala followed by University of Kerala and MG University. More documents were produced on Science and Engineering subjects. Growth of literature in social science is low. Compared to major universities, the growth of scholarly literature from the Universities in Kerala found to be low.*

**Keywords:**  Scientometrics, Bibliometrics, Research Productivity, Publication Trends, Authorship Pattern, Kerala - Universities

## 1.  Introduction

Since their inception, universities have been recognized for their position as flagship institutions within society as they bring ideas, philosophies and innovations (Chareonwongsak, 2000). Universities play a key role in the generation, transfer and application of knowledge.  The intellectual dynamism, resourcefulness and economic prosperity of a country are reflected in the quality of university education and research. The production of scholarly literature is an important accomplishment of any university. Universities are ranked based mainly on the quantity of scholarly literature in peer-reviewed journals. Hence, measuring the growth of scholarly literature in a university is an important area of research that brings valuable facts and figures on the status of a university. This paper explores the amount of scholarly Literature produced by the universities in the state of Kerala from 1960 to 2015.

## 2.  Universities in Kerala

As on 26-11-2014, India has 693 Universities with a distribution of State Universities (325), Deemed to be Universities (128) Central Universities (45) and Private Universities (195).  The State of Kerala has 15 Universities including a Central University and two Deemed Universities. Kerala represents 3% of State Universities.  The following are the list of Universities in Kerala. The State Universities are listed from Sr.No 1 to 12.

1.  Calicut University;
2.  Cochin University of Science & Technology;
3.  Kannur University;
4.  Kerala Agricultural University;
5.  Kerala University;
6.  Kerala University of Fisheries & Ocean Studies;
7.  Kerala University of Health Sciences;
8.  Kerala Veterinary & Animal Sciences University;
9.  Mahatma Gandhi University;
10. National University of Advanced Legal Studies

11. Sree Sankaracharya University of Sanskrit;

12. Thunchath Ezhuthachan Malayalam University;

13. Central University of Kerala (Central University);

14. Indian Institute of Space Science and Technology (Deemed University); and

15. Kerala Kalamandalam (Deemed University).

## 3. Objectives

The study aims to understand the growth of scholarly literature produced by the Universities in Kerala. The study intends to understand the ranking of universities in Kerala among Indian Universities and higher education institutions. The following are the objectives of the study;

- Find out the total number of documents produced by universities in Kerala during 1960-2015.

- Discover the major subject field of research in Kerala

- Determine the most prolific authors in Universities in Kerala

- Ascertain the major source of publication and types of documents

- Rank the universities in Kerala on the basis of number of documents

- Determine the position of universities in Kerala among Indian universities and higher education institutions.

## 4. Literature Review

There are many bibliometric and scientometric studies to assess the research productivity of various institutions. Majority of these studies depended on multiple databases to measure research outputs of institutions.

Valencia (2004) surveyed productivity, in terms of international scientific publications, in selected science and engineering departments of the two lead research universities of the Philippines for the period 1998-2002. Publication data used in this survey came from the Science Citation Index (SCI), which is a database produced and maintained by the Institute for Scientific Information (ISI). The result indicated that overall individual average research productivity of the 465 faculty members was 0.20 for the period. The basic science departments were the most productive in terms of international publications. The frequency distribution of individual productivity levels indicated that majority (62.4%) of the surveyed faculty members had no international publications at all during the period covered.

Kumbar, Gupta and Dhawan (2008) analyzed the research output of scientists of University of Mysore in science and technology using Scopus database and found that the research in the University was growing. Chiemeke (2009) analysed research outputs of Nigerian tertiary institutions using journals randomly selected from African Journals Online (AJO) and found that there was no significant decline in research outputs. Mukherjee (2008) made an analysis of the scholarly literature from selected universities of Delhi and Uttar Pradesh using Web of Science. The results showed that among the four universities, the authors of Delhi University contributed the highest number of articles, followed by Banaras Hindu University. Kaur and Mahajan (2012) made a comparative evaluation of research output of two pioneer institutions in medical sciences – AIIMS, New Delhi and PGIMER, Chandigarh using SCOPUS. The analysis of the data indicated AIIMS contributed more publication than PGIMER. Majhi and Maharana (2012) analysed quantitatively the growth

and development of Physical Science Research in Sambalpur University in terms of publication output as reflected in SCOPUS from 1971 to 2010 and found that 417 papers were published by the researchers. Chirici (2012) conducted a twofold study to present the results of an assessment of the global aggregated scientific productivity of the Italian forestry community during 1996-2010 using the SCOPUS data available from the on-line SCIMAGO system; and to compare the Web of Science and SCOPUS with respect to the number of publications, number of citations and h-index. The study found that both Web of Science and SCOPUS were suitable sources of information for evaluating the scientific productivity of Italian authors. Siwach and Kumar (2015) investigated the research contributions of Maharshi Dayanand University, Rohtak in terms of its publication output during 2000-2013 as reflected through Scopus database. The study analysed the year-wise research productivity, its citations impact, national and international collaborations and top collaborating institutions.

## 5. Methodology

The data for the study was collected from the SCOPUS database of Elsevier. Scopus is the largest abstract and citation database of peer-reviewed literature that includes scientific journals, books and conference proceedings. It covers 55 million records and 21,915 titles from 5,000 publishers. The data was collected in January, 2015.

Though there are 15 universities in Kerala, the study is limited to six state universities. They are alphabetically listed below;

1. Cochin University of Science & Technology (CUSAT)

2. Kannur University (KU)

3. Kerala Agriculture University (KAU)

4. Mahatma Gandhi University (MGU)

5. University of Calicut (UC)

6. University of Kerala (UK)

The rest of the universities in Kerala were excluded from the study due to the availability of less number of documents as well as non-searchable by affiliation search in SCOPUS.

## 6. Findings

### 6.1 Overall Research Performance

The six universities in Kerala under study have produced a total number of 11764 documents during the study period. Among this, CUSAT is top with a share of 4416 (37.53%) documents followed by the University of Kerala (UK) with 3222 (27.81%) documents, Mahatma Gandhi University (MGU) with 1980 (16.83%) documents, University of Calicut (UC) with 1293(10.99%), Kerala Agricultural University (KAU) with 581 (4.93%) and Kannur University (KU) with 272 (2. 31%) documents. Figure 1 shows the number of research documents by six state universities in Kerala.
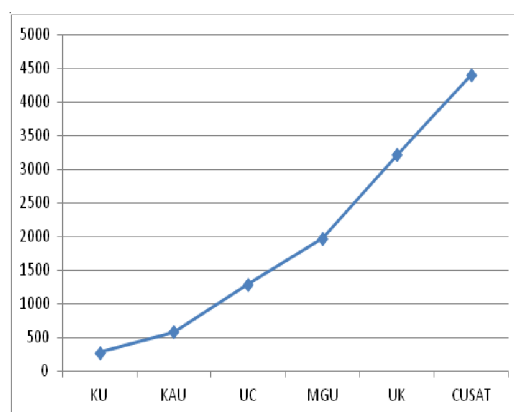


**Figure 1 : Number of Documents by Universities in Kerala**

The examination of the document type revealed that majority belong to Journal articles. Out of 11764 documents 9961 (84.67%) are Journal articles, followed by 1141 (9.69%) conference papers and 662 (5.62%) are other types that include reviews, book chapters, editorials, letters, books, books chapters, notes, erratums and short surveys.

## 6.2 Major Research Areas

The study has examined the major area of research in the universities in Kerala. The result shows that there is a difference in the major areas of research among universities. In CUSAT the major subject field of research is Physics and Astronomy (18.6%) followed by Material Science (17.8%), Engineering (14.4%), Chemistry (9.4%) and Computer Science (5.4%). In UK the major research area is Biochemistry, Genetics and Molecular Biology (12.6%) followed by Chemistry (9.7%), Agricultural and Biological science (9.2%), Material Science (8.7%) and Physics and Astronomy (8.3%). In MGU, more papers were on Materials science (27.7%) followed by Chemistry (18.8%), Physics and Astronomy (10.7%), Engineering (7.3%) and Biochemistry, Genetics and Molecular Biology (7.1%). Agricultural and Biological science (20.4%) is more prominent in UC. And there are Chemistry (17.7%), Physics and Astronomy (13.2%), Biochemistry, Genetics and Molecular Biology (7.7%) and Material Science (5.9%). KU's major contribution belongs to Computer Science (15.9%) followed by Physics and Astronomy (13.7%), Biochemistry, Genetics and Molecular Biology (12.4%), Chemistry (9.2%) and Engineering (8.1%). KAU's focus is on Agricultural and Biological science (55.5% followed by Veterinary (16.4%), Environmental Science (5.2%), Biochemistry, Genetics and Molecular Biology (4.5%) and Earth and Planetary Sciences (3.7%).

Overall, the ten major areas of research in the universities in Kerala are Materials science (2767 Documents) Physics and Astronomy (2405), Chemistry (2109) Engineering (1718), Agricultural and Biological Sciences (1614), Biochemistry, Genetics and Molecular Biology (1306), Chemical Engineering (954), Earth and Planetary Sciences (820), Environmental Science (774) and Computer Science (734). The Figure 2 shows the ten major areas of research in Kerala.
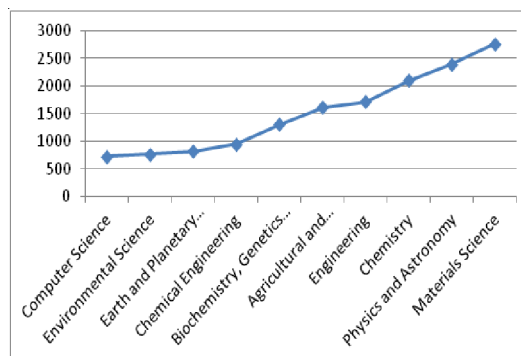


**Figure 2: Major Research Area in Kerala**

The number of research papers in social sciences is low in all the universities. This may not be due to the absence of research articles in social sciences, but for these articles are appeared in journals that are not indexed by SCOPUS.

## 6.3 Most Prolific Authors

The study has tried to identify the five most prolific authors from the Universities in Kerala. Table 1 provides a list of highly productive authors with the number of documents associated with them and the number of citations received for their papers.

### Table 1: Prolific authors from Universities in Kerala

| Sl. No | Authors | No. of Documents | No. of Citations | University |
|---|---|---|---|---|
| 1. | Thomas S. (Sabu Thomas) | 566 | 13889 | MGU |
| 2. | Nampoori V.P.N. | 341 | 2789 | CUSAT |
| 3. | Mohanan P. | 270 | 2991 | CUSAT |
| 4. | Radhakrishnan P. | 210 | 1702 | CUSAT |
| 5. | Vallabhan C.P.G. | 207 | 2015 | CUSAT |

Dr. Sabu Thomas from Mahatma Gandhi University is the most prolific author with 566 publications and 13889 citations. Dr. VPN Nampoori, associated with International School of Photonics (ISP), CUSAT comes second with 341 documents and 2781 citations. The third, fourth and fifth prolific authors also belong to CUSAT.

English is the prominent language of documents published by the members of universities in Kerala. However, there are papers in Spanish, Russian, Portuguese, French, German, Italian, Polish and Turkish by the university community in Kerala.

### 6.4 Foreign Collaboration

The collaboration of researchers from different universities influences the productivity of research papers. The examination of collaboration revealed that researchers from universities in Kerala have produced documents in collaboration with researchers belonging to different universities in India. They have also collaboration with researchers from United States, United Kingdom, Germany, Japan and France. However, majority of documents were produced in own environment. The Table 2 shows the status of foreign collaboration of universities in Kerala with five major developed nations in the world.

### Table 2: Collaboration with Foreign Universities

| Country | CUSAT | KAU | KU | MGU | UC | UK | Total |
|---|---|---|---|---|---|---|---|
| France | - | 3 | 1 | 64 | 14 | 15 | 97 |
| Germany | 43 | 1 | 3 | 60 | 30 | 21 | 158 |
| Japan | 84 | 1 | - | 20 | 9 | 43 | 157 |
| UK | 40 | 7 | - | 54 | 33 | 68 | 202 |
| US | 139 | 33 | 7 | 54 | 58 | 73 | 364 |
| Total | 306 | 45 | 11 | 252 | 144 | 220 | 978 |

Out of 11764 documents 978 (8.31%) were produced by collaboration with five developed nations. CUSAT is top with 306 documents followed by MGU (252), UK (220) UC (144), KAU (45). The KU has produced less number of documents in foreign collaboration.

## 6.5 Last Ten Year's Output

The study has attempted to assess the productivity of universities in Kerala for the last ten years ; 2005-2014. CUSAT was top with more documents during this period. Majority (2847) of the documents by CUSAT were published during the last ten years. In UK, out of 3228 documents 1689 were published during the last ten years. In CU 1258 documents out of 1980 were published during the last ten years. Other universities also follow this trend.

## 6.6 Preferred Publication Sources

The authors tried to list top ten publications with their publisher and number of documents. The Table 3 presents a list of ten journals which contain more documents from universities in Kerala.

### Table 3: Major Journals that Contain More Documents from Kerala

| Journal | Publisher | No. of Documents |
| --- | --- | --- |
| Journal of Applied Polymer Science | Wiley | 144 |
| Microwave and Optical Technology Letters | Wiley | 124 |
| Indian Journal of Experimental Biology | NISCAIR | 122 |
| Indian Journal of Biochemistry and Biophysics | NISCAIR | 93 |
| Journal of Applied Polymer Science | Wiley | 81 |
| Proceedings of SPIE the International Society for Optical Engineering | SPIE | 72 |
| Indian Journal of Animal Sciences | ICAR | 68 |
| Journal of Applied Physics | AIP | 67 |
| Indian Journal of Marine Sciences | NISCAIR | 62 |
| Proceedings Animal Sciences | Springer | 56 |

## 6.7 Ranking of Universities

SCOPUS list 2359 institutions in India that have produced varying amount of documents. Indian Institute of Science, Bangalore is the institution having rank one with 36004 documents followed by BARC, Mumbai with 25078 and IIT Delhi with 23442 documents. CUSAT, the top ranking university in Kerala has 55th position in India. The UK has 84th rank followed by MGU with 147th, UC with 214th, KAU with 404th and KU with 696th position.

## 7. Findings

The total number of documents published by the university academics of Kerala for the period of 2009-2013 is 11764. Among six universities under study (CUSAT, KU, KAU, MGU, UC and UK) CUSAT bags top rank in research productivity. The study found that University academics prefer foreign journals to publish their research outputs. Universities in Kerala made a remarkable growth of productivity during the last ten years. Even though there is a difference in interest of subject fields in each university, some subject fields like Materials science, Physics and Astronomy, Chemistry and Engineering are most productive area of research in Kerala. Compared to other Indian universities and institutions, research productivity by the universities in Kerala found to be low.

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