

Research Output of University of Jaffna, Sri Lanka during 2000-2019

Thivya Janen

University of Jaffna, Sri Lanka

E-mail: jthivya@eng.jfn.ac.lk

ABSTRACT

Universities play a vital role in the research and development of a country. A scientometric analysis is an essential tool used by the administrators, funding agencies, government, and researchers to know the publication trend on a topic, institution, author, journal, etc. This study analyses pattern of articles published by the University of Jaffna (UoJ) during 2000-2019; identifies publication growth rate, most prolific authors and their citation impact, communication pattern in terms of type of documents, journal publishing country and impact factor of these journals and also the international collaboration. Analysis of the data indicates, there are 293 articles were published in WOS indexed journals. The publication growth rate indicates that there is a consistent growth in the number of publications after 2014. It was found that multi-authorship dominates among UoJ researchers. A high number of publications were on Multidisciplinary Sciences. The UoJ collaborated with different countries; among them 59 articles were published with United Kingdom. Among the highly cited top 10 publications, an article authored by Ravirajan P received a high number of citations of 480. Among the funding agencies National Science Foundation of Sri Lanka funded for 24 publications, while UoJ funded for 16 and among the international funding agencies UK Research Innovation (UKRI) funded for 7 publications during the study period.

Keywords: University of Jaffna; Scientometric analysis; Research trend; Authorship analysis; Productive author

1. INTRODUCTION

Sri Lankan University system plays an important role in the country's research productivity. University Grant Commission of Sri Lanka is the governing body of the university system which was established on December 22nd 1978. The main functions of UGC are, planning and coordinating the university education, allocating funds to higher educational institutions, maintaining academic standards, regulating administration and student admission¹. The Sri Lankan government motivates the university academics in research by providing more importance to their promotions, offering grants for research, annual awards as well as giving a monthly research allowance equivalent to 35 per cent of their base salary.

University of Jaffna (UOJ) was established in 1974 in the northern province of Sri Lanka. Over the 46 years, it has grown up to a level of having one campus in Vavuniya, eleven faculties, and two units of Ramanathan Academy of Fine arts and Siddha Medicine. It also has a student population of over 10,500 undergraduate and postgraduate with 350 academic staff². Universities are playing a significant role in disseminating knowledge through research and development. Continuous research in universities has become essential as it contributes to knowledge, technological improvement, and policy making. The output of the research will contribute to the

socioeconomic of the country and improve competences in the teaching and learning process.

Research output of UoJ was badly affected due to the civil unrest continued for 30 years till 2009. This is mainly due to the internal displacement of people, closure of university activities for a long period of time, restriction to import equipment and chemicals, migration of senior academics to foreign countries and inability to undergo post graduate programs in foreign universities. Research productivity of a university is measured through a number of research publications in peer reviewed indexed journals, presented at the national/international conference/ symposium, number of book chapters contributed etc. Research articles in a peer reviewed and indexed journals are being considered as a major component for measuring the research productivity of the University."Scientometric assessment evaluates scientific research productivity and it is referred as a science about science". Scientometric analysis is a widely used tool and technique and gives an understanding of an institution's research performance³. The scientometric indicators are, annual research trend, author contribution, sources used to publish, collaborated institutions and countries, collaboration networks, citations, keyword occurrences, and funding agencies. R tool is a free and open source software and developed in R language used in data science, statistics and visualizing. It is designed for comprehensive bibliometric analysis⁴.

This study will help the researchers and administrators to evaluate scientific progress of a university. With this view, this study aims to determine the research performance of the UoJ by analyzing the scholarly publications indexed in the WOS database from 2000 to 2019 through the scientometric analysis.

2. LITERATURE REVIEW

Several Scientometric studies have been carried out to analyse the research productivity of educational institutions. Among them, few are reviewed for this study.

Wijetunge, P, Sila, A and Manatunga, K⁵ studied for the research productivity of the selected five Universities in Sri Lanka during 2015 to 2018. Authors have studied the citation impact and collaboration metrics using SciVal, and the contribution of the university libraries. This study includes University of Colombo (UoC), University of Kelaniya (UoK), Peradeniya (UoP), Ruhuna (UoR) and Sri Jayewardenepura (UoSJP). Result of this study revealed that, 4723 publications were authored by 3831 authors and UoC and UoP had the highest number of publication during this study period among the selected universities. The author also stated a number of research support services by the libraries such as, updating the collections, providing conducive environment for research, training in searching information, referencing style and use of reference management software, plagiarism detection and maintaining the Institutional repositories

Chandani, J.G. and Nayana, W⁶ conducted the visibility of UoSJP in Scopus. This paper focused on the annual growth rate of publications, most productive faculties, highest published document type, most productive author and collaboration pattern. Author's used quantitative methodological approach with the descriptive analysis.

Navaneethakrishnan,^{S7} studied the Sri Lankan research output at international level based on Scopus, during 1980-2009. This study identified the Sri Lankan research performance using the number of publication during the study period, prolific authors, international collaboration, document types, language distribution, most productive institution, dominant subject disciplines, and journals used by the Sri Lankan authors.

Santhakumar, R, Kaliyaperumal, K, and Louies, S⁸ conducted a scientometric analysis at the University of Madras. Researchers analysed the research productivity of the university indexed with WOS for ten years from 2009 to 2018. The author has studied the annual distribution and growth of literature, most prolific authors, types of publications, the countries that are collaborated with the universities, journals used by the researchers, subject wise distribution, and highly cited papers of the institution.

Yadav, Verma, and Singh³ evaluated Mizoram University's publication output during 2004-2017 based on the Indian Citation Index. The study included collaborative index, collaboration co-efficient, co-authorship index, annual authorship distribution, and collaborative research output during the study period.

A number of studies were conducted in Sri Lanka to measure the research performance of the state Universities and different subject disciplines, and a few were thoroughly

reviewed for this study. All the studies were based on the Scopus database, but at present UGC of Sri Lanka promotes the researchers to publish their research outputs in the WOS indexed journals. Academic promotions system accepts Science Citation Index Expanded (SSCE), Social Science Citation Index (SSCI) and Arts and Humanities Citation Index (AHCI) as a recommended indexing system. Through the literature survey, it was identified to study the research productivity in the WOS indexed journals. With this identified gap, this study planned to measure the research productivity of UoJ based on WOS indexed journals.

3. OBJECTIVES

- Find out the publication growth rate of the (UoJ) from 2000 to 2019
- To analyse the authorship pattern and collaboration quantity of UoJ research output
- To identify the most prolific authors and their citation impact
- To study the subject distribution of the publication from UoJ
- To examine the communication pattern of the authors
- To identify the international collaboration strength and funding agencies supported to the university.

4. METHODOLOGY

This study aims to quantify the UoJ, Sri Lanka scholarly literature published in the journals indexed in WOS. Published literature were collected using the general search option of WOS. Search query "University Jaffna" was typed in the address field and the search option limited to twenty years from 2000–2019. A total of 293 records were downloaded and used for further analysis. The retrieved data was analysed using MS-Excel, bibliometric app (Using R tool)⁴, and VOS Viewer. Number of authors collaborated for a paper was counted using excel. Authorship was categorised as, single, two multiply authored (three and four authors) and mega authored (five or more)⁹. Authorship analysis was counted using complete counting method¹⁰. Authorship collaboration is measured using the MS-Excel mathematical formula. The scientific corporation network were developed using VOS viewer software using full counting method¹¹.

Collaborative Coefficient was counted by considering formula suggested by Ajiferuke¹²,

Which is represented by:

$$CC = 1 - \frac{\sum_{j=1}^A \frac{1}{j} (ff)}{N}$$

Where j = Authorship, ff = Number of j - authored research papers, N = the total number of research papers and A = the total number of authors per paper,

5. DATA ANALYSIS

5.1 Publication Growth Rate

Figure 1 shows the publication growth rate of UoJ excluding the meeting abstracts and new items. The UoJ has

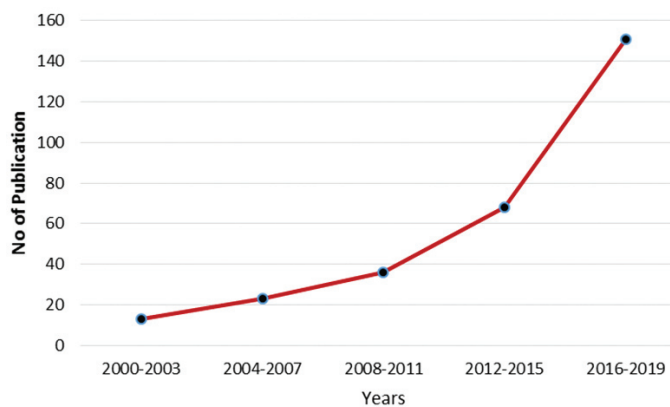


Figure 1. Publication growth rate.

Table 1. Top 10 authors based on number of publications

Author	Articles	Citation	Average citation per item	h index
Surendran SN	44	557	12.66	15
Ramasamy R	29	417	14.38	13
Ravirajan P	22	1429	64.95	9
Jude PJ	17	250	14.71	10
Vignarooban K	12	784	65.33	10
Karunaratne SHPP	12	115	9.58	6
Kuganathan N	12	101	8.42	6
Gajapathy K	12	95	7.95	6
Chroneos A	11	94	8.55	5
Thanihaichelvan M	11	69	6.27	5

Table 2. Top 10 authors based on dominance factor

Author	Dominance factor (DF)	No of articles	First authored	Ranked by articles	Ranked by DF
Kuganathan, N	0.75	12	9	7	1
Vignarooban, K	0.66	12	8	8	2
Surendran, SN	0.45	44	20	1	3
Gajapathy, K	0.42	12	5	5	4
Thanihaichelvan, M	0.36	11	4	10	5
Ravirajan, P	0.18	22	4	3	6
Ramesh, S	0.18	11	2	1	7
Jude, PJ	0.18	17	3	4	8
Ramasamy, R	0.17	29	5	2	9
Karunaratane, SHPP	0.83	12	1	6	10

contributed 293 publications during the 20 years of the study period. Growth of publication analysis revealed that 2019 had the highest number of publications with 50 (17.06 %), and 2005

had the lowest number of publications with 1 (0.34 %). There was an increase in the number of publications from 2015 to 2019. The University had an h-index of 31, and the total citation received during the study period was 5361. The highest citation was observed 846 for the article published during 2006; among the 846 citations, a paper authored by Ravirajan,P, received 480 citations. It was also recorded as a highly cited paper between 2000 and 2019. The annual percentage of the growth rate of UoJ publication is 15.71. The numbers of publications steadily increased after 2010. UoJ and the publication trend was badly affected by the 30 year civil unrest which ended in 2008. As per the circular 916 of 2009 pertaining to the promotion to the post of professor UGC gives value to research and publication published in the WOS indexed journals¹³. The UoJ researchers were communicated their research output in variety of communication formats. It was found that 245 (83.61 %) out of the total 293 are journal articles. Followed by review articles were 17 (5.80 %), proceeding papers 8 (2.73 %), editorial materials 4 (1.36 %), and letters 2 (0.68 %).

5.2 Authorship Analysis

“Scientific communities can be conceived as clusters of researchers with essential roles in modern science”¹⁴. Authorship analysis is a vital step in scientometric studies as it plays a significant role in an institution’s, information dissemination and communication activities. Considering the present scenario, collaborative work enables scientist from different disciplines to find solutions to the present challenges. Collaboration is not limited to authors, and it is extended even to institutions and countries¹⁵. The total number of authors contributed for research publications during the study period is 1328. Among this, single authored articles were 17. According to the authorship analysis, average co-authors per article 4.55, and the collaboration index for authorship 2.7. The collaboration index is the average number of authors per article.

5.2.1 Most Productive Author

The most productive author is identified based on the number of publications published in WOS indexed journals during the study period. H index is an author-level metric that measures the number of publications and number of citations. It also correlates the number of citations and publications (Table 1). Among the top 10 publications, five are from faculty of science and two from faculty of medical. Faculty of Science is dominating the top 10 author’s profile. Surendran, SN attached to the Department of Zoology, Faculty of Science, leads the top 10 author list with 44 publications and 15 h index, followed by Ramasamy, R with 29 and Ravirajan, P with 22 publications. Considering the number of citations, Ravirajan, P. attached to the department of

Physics, faculty of Science leads with 1429 citations for his 22 publications. Also, his four manuscripts were placed among the top 10 cited publications.

Table 2 displays the top 10 authors based on the dominance factor. The dominance factor indicating the fraction of multi-authored articles in which a scholar appears as first author. Kuganathan, N is the leading author with the DF of 0.75. He was the first author for his nine publications out of 12 multi-authored publications, followed by Vignarooban, K with 0.66 and Surendran, SN with 0.45.

5.2.2 Author Collaboration

Table 3 presents the single, two, multi and mega authored articles and collaboration measurements during the study

Table 3. Author collaboration of UOJ

Year	Single	Two	Multi authored	Mega authored	Total	CC
2000	0	0	2	1	3	0.66
2001	0	1	2	2	5	0.68
2002	1	0	1	0	2	0.25
2003	0	2	1	0	3	0.50
2004	0	0	2	2	4	0.74
2005	0	0	0	1	1	0.63
2006	1	2	3	4	10	0.55
2007	0	2	4	1	7	0.63
2008	0	3	2	1	6	0.60
2009	2	2	1	2	7	0.33
2010	1	4	6	1	12	0.57
2011	0	4	5	2	11	0.56
2012	0	5	3	5	13	0.60
2013	1	7	8	7	23	0.59
2014	0	3	5	5	13	0.62
2015	1	2	10	7	20	0.65
2016	3	7	4	9	23	0.50
2017	0	5	11	18	34	0.62
2018	2	7	17	18	44	0.64
2019	5	3	18	24	50	0.62

period. In 2019, 24 out of the 50 articles published included more than five author collaboration. The highest number of single-authored articles 5 published during 2019, where 7 double authored articles in 2016 and 18 multi authored articles 2019. The total article published with mega authors during this study period is 110.

The Collaborative Co-efficient (CC) makes possible to draw a comparison between years. Collaboration Coefficient is a number between 0 and 1. The more it is bigger than 0.5 the better is the collaboration rate among the authors. When it is near 0, it means that authors have a weak collaboration. According to the Table 3 highest collaboration observed during 2004 as 0.74.

Figure 2 illustrates the relationship among author collaboration and number of citation received. Highest citation received 2345 for its 59 publications with the double authors, whereas low number of citation received 110 for 262 publications contributed by more than five authors. This shows, the number of citations decrease with the increase of author collaboration. In general perspectives it is in other way around. Where the multi authored articles were contributed by the multidisciplinary subject experts, due to this citations are increased with the multi authored articles. In the case of UoJ limited numbers of multidisciplinary researchers were included in more than five author collaboration. This could be the reason for the decrease of citation with the increase of author collaboration

Table 4. Top 10 subject wise distribution

Subject	No of articles	Citation	Average citation per item	h index
Multidisciplinary sciences	27	144	5.33	7
Tropical medicine	26	268	10.31	9
Parasitology	24	264	11	9
Materials science multidisciplinary	22	830	37.73	9
Physics applied	17	45	26.47	8
Entomology	15	171	11.4	7
Infectious diseases	14	177	12.64	6
Engineering electrical electronic	14	88	6.29	6
Energy fuels	10	805	80.5	7
Plant sciences	10	41	4.1	3

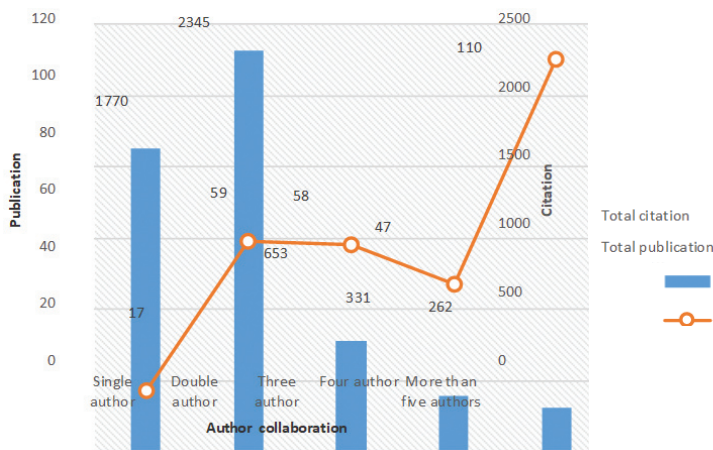


Figure 2. Author collaboration Vs the number of publication and sum of citation.

5.3 Subject Wise Distribution

Table 4 reveals the top 10 WOS subject categories under which the researchers have published their research output. It has been found that multidisciplinary sciences obtained the top rank with 27 (9.21 %), followed by topical medicine 26 (8.87 %), and parasitology 24 (8.19 %). Table 4 also reveals the citations received for the respective subjects, material science multidisciplinary received high citation 830 among the total citation of 5361, followed by energy fuels with 805 and

tropical medicine 268. Energy fuel subject have the highest average citation per item, of 80.5. Subject h index explains the number of publication equal to the number of citation. In this study, tropical medicine, parasitology and material sciences multidisciplinary obtained the h index of nine. H index means that nine out of 26 publications are received either equal or more than nine citations in tropical medicine. This result will help the institution to identify the disciplines, which have more output and need to be strengthened.

5.3.1 The Measure of International Collaboration For Research Productivity

Figure 3 shows the international collaboration of UoJ with different countries. It displays the number of publications, average citation per publication and h index with top 10 countries. Figure 3 shows that, out of 291 publications, 274 (94.15 %) were collaborated with 17 different countries. Among them 59 (20.27%) were collaborated with the United Kingdom, followed by the USA 41 (14.09 %) and Australia 33 (11.34 %).

University academic carried out their post graduate studies in different countries, which was the main reason to

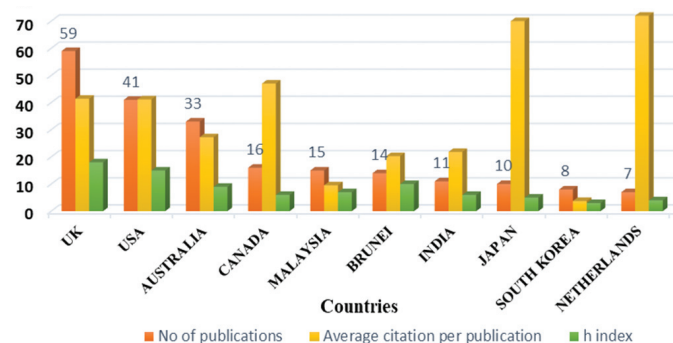


Figure 3. International research collaboration with different countries.

bring more international collaborated publications. UK, USA and Australia are the leading countries that offer academics from developing countries scholarships for their post graduate studies. University academics are also entitled to 3 years and 9 months of paid study leave for their postgraduate studies. This facilitates the researchers to carry out their research in foreign countries and bring in more international collaboration. Limited numbers of international collaborated research were carried out in UoJ during the study period. Postgraduate studies carried by the academics bring more international collaborated publication for UoJ. When they are going on scholarships, some foreign universities not allowed publishing with the UoJ affiliation during their study period at the foreign universities. This will affect the research output of UoJ even though the academic staffs were sent on scholarship with paid leave.

The highest numbers of citations trailed by UK is 2443 out of 5361, followed by USA 1688 and Australia 899. The highest h index was observed for UK with 18, which means among 59 publications, 18 publications received more than 18 citations, followed by USA 15 and Brunei 10.

5.4 Highly Cited Top Ten Publications

Table 5 shows the highly cited top 10 publications contributed by the UoJ authors. It has been found that the manuscripts titled “Hybrid polymer/zinc oxide photovoltaic devices with vertically oriented ZnO nanorods and an amphiphilic molecular interface layer” authored by Ravirajan, P is ranked first out of the total 291 publication between 2000 and 2019 with a total citation of 480. Among the top 10 manuscripts, the manuscript of Ravirajan, P placed 1st, 4th, 8th and 9th ranks. These four manuscripts were published in the field of chemistry, and material sciences and received 1153 citations. Second and third rank were received for the manuscripts authored by Somasundram, D with 391 and 302 citations respectively.

Table 5: Top ten ranked publications based on citation

Rank	Author name	Document type	Subject category	Total citation	Year	Source title
1	Ravirajan, P	Article	Chemistry	480	2006	Journal Of Physical Chemistry B
2	Somasundaram, D	Article	General & Internal Medicine	391	2001	Journal Of The American Medical Association
3	Somasundaram, D	Article	Psychiatry	302	2013	World Psychiatry
4	Ravirajan, P	Article	Chemistry, Materials Science	281	2007	Journal Of Materials Chemistry
5	Vignarooban, K	Review	Energy & Fuels, Engineering	296	2015	Applied Energy
6	Somasundaram, D	Editorial Material	General & Internal Medicine	265	2013	Lancet
7	Kannan, N and Vakeesan, D	Review	Science & Technology - Other Topics, Energy & Fuels	237	2016	Renewable & Sustainable Energy Reviews
8	Ravirajan, P	Article	Chemistry, Materials Science	228	2006	Journal Of Materials Chemistry
9	Ravirajan, P	Article	Materials Science, Physics	164	2004	Physical Review B
10	Vignarooban, K	Review	Thermodynamics, Engineering, Mechanics	155	2019	International Journal Of Heat And Mass Transfer

5.5 Scattering of Articles in Different Journals

Table 6 reveals the top 10 journals chosen by the authors of UoJ for their publications. Researchers used 193 different

Table 6. Top 10 journals used for publishing research result

Source Name	IF (2020)	Country	No of publications	Citation
Journal of the National Science Foundation of Sri Lanka	0.08	Sri Lanka	16	31
Parasites & Vectors	1.19	UK	12	109
Ceramics International	1.28	UK	6	63
Journal of Nanoelectronics and Optoelectronics	0.20	USA	5	20
Malaria Journal	0.93	UK	5	77
Statistical Papers	0.95	USA	5	57
Bjog-An International Journal of Obstetrics and Gynaecology	1.90	USA	4	0
Journal of Geometry and Physics	0.84	Netherland	4	9
Scientific Reports	0.80	Germany	4	72
Bmj-British Medical Journal	6.27	UK	3	31

Table 7. Distribution of output by publishing country of journals

Country	Number of Journals	% of Journals	Number of articles	% of articles
United Kingdom	62	32.12	101	34.47
USA	54	27.98	78	26.62
Netherland	23	11.92	31	10.58
Switzerland	21	10.88	26	8.87
India	7	3.63	11	3.75
Germany	5	2.59	6	2.05
Chile	2	1.04	3	1.02
Hungary	2	1.04	2	0.68
Romania	2	1.04	2	0.68
Sri Lanka	2	1.04	18	6.14

Table 8. Distribution of papers by impact factor

Range of IF	Category	Number of Papers	Percentage
Zero	Very Low	0	0
0.1-0.9	Very Low	189	65.85
$\geq 1.0 < 2.0$	Low	82	28.57
$\geq 2.0 < 3.0$	Medium	6	2.09
$\geq 3.0 < 5.0$	High	1	0.35
≥ 5	Very High	9	3.14
TOTAL		287	100.00

sources to publish their research findings. The highest number of publications found in the Journal of National Science Foundation of Sri Lanka (16) followed by Parasites and vectors (12) and ceramic international (6). High average citation (10.33)

was received for the articles published in British Medical Journal, with IF is 6.27. The impact of any research article is expressed by the number of citation it received in world literature. Articles published in high impact journals gives more visibility because, it has wide international guaranteed visibility due to its indexing in numerous databases and publishes. Articles in English, make more attractive to researchers to consume its contents. Identifying the most influential journals for their respective disciplines, can help researchers to disseminate their findings among global scientific community.

Table 7 explain the output by publishing country of journal, UoJ researchers used 62 (32.12%) different journals published by UK to publish 101 articles during the study period. Comparison between % of journals and % of articles, reveals the distribution of articles among different journals. When the difference is low the distribution is high. Among the top 10 distribution high difference were observed in Sri Lankan journals, i.e 18 articles were published only in 2 different journals.

Based on the impact factor ranges shown in Table 8, where 287 articles published. Impact factor divided into five category 0.1-0.9 (very low), $\geq 1.0 < 2.0$ (low), $\geq 2.0 < 3.0$ (medium), $\geq 3.0 < 5.0$ (high) and ≥ 5.0 (very high)¹⁵. Distribution of output shows, 65 per cent of the articles are published in very low impact factor journals (0.0-0.9). More than 25 per cent (28.57%) of the articles published in low impact factor journals. UoJ author have published 9 articles (3.14%) in very high impact factor (≥ 5.00) journals.

5.6 Funding Agencies

Source of funds for research is an important factor that affects the quality of the research output. Research quality depends on the accuracy of the result, methodology followed by the researchers and equipment's used. Researchers in natural science and applied science require more funds to purchase equipment and chemicals. As such they depends more on the research grants or funds. Table 9 shows that,

researchers in UoJ receive more research funds from National Science Foundation (NSF) of Sri Lanka. Further it also reveals NSF funded for 24 publications during the study period. NSF serves and strengthen the Science and Technology sector in Sri Lanka, facilitate research, and development and innovation to create a knowledge economy. Information pertaining to the funding agencies will be helpful for the young researchers to learn about the funding for their research.

6. CONCLUSION

Scientometric assessment of research publications of any institution is a valuable tool to identify its strength and

Table 9. Funding agencies supported for UoJ research

Funding Agencies	No of publication	% of Total
National Science Foundation of Sri Lanka	24	8.24
University of Jaffna	16	5.49
UK Research Innovation (UKRI)	7	2.40
Engineering Physical Sciences Research Council (EPSRC)	6	2.06
High Performance Computing Centre at Imperial College London	5	1.71
National Research Council of Sri Lanka	4	1.37
SIDA SAREC	4	1.37
Australian Research Council	3	1.03
Higher Education and Research Collaboration on Nanomaterial for Clean Energy Technologies HRNCET Project	3	1.03
United States Department of Health Human Services	3	1.03
University Grant Commission of Sri Lanka	3	1.03

weakness. This study attempts to analyse the publication trend of the University of Jaffna indexed with WOS from 2000 to 2019. From 2000 to 2008, researchers attached to the UoJ faced many problems due to civil unrest. The annual publications show the quantity, and also it revealed that after 2014 number of publications increased slowly and steadily. After introducing the new promotional scheme for university academics, the University Grant Commission encouraged to publish their research output in WOS index journals. Authorship analysis will indicate the most productive author in research and their collaboration pattern. It was found that Surendran, SN is a productive author concerning number of publication (44). At the same time, Ravirajan, P is a leading author with a high citation for his publication (1429) among UoJ authors. Author collaboration pattern reveals that more than five authors contributed to 110 articles, and its collaboration index was 11 during the year 2005, followed by 59 double authored articles and 58 three authored articles. The subject wise distribution indicates the diversity in the research strength of UoJ. Among the top 10 WOS subject discipline, a high number of publications found in Multidisciplinary sciences (27) followed by Tropical medicine (26) and Parasitology (25). This situation indicates that the UoJ must encourage researchers in Social Science and Art, & Humanities. The international collaboration pattern will visualise the foreign collaboration strength by the UoJ researchers. Another impotent factor that promotes the research activity is the availability of funds and funding agencies, UoJ getting research funds from national and international funding agencies. Among the source of publication, high numbers of articles were published in the Journal of National Science Foundation of Sri Lanka. The output of this analysis will

help the administration to identify the trend of UoJ research in WOS indexed journals. The new researchers can visualise the situation and have an idea on subject dominance authors, highly used journals, and optimum collaboration to get the maximum output.

REFERENCES

1. www.ugc.ac.lk/index.php?option=com_content&view=article&id=3&Itemid=3&lang=en (Accessed on 7th December 2020).
2. http://www.jfn.ac.lk/index.php/history/ University of Jaffna. History | University of Jaffna [Internet]. Jaffna: University of Jaffna; 2020[cited 2020 Dec 7]. Available from: http://www.jfn.ac.lk/index.php/history/ (Accessed on 7th December 2020).
3. Yadav, S.K.; Verma, M.K & Singh. S.N. Research Productivity of Mizoram University during 2004-2017: A Scientometric Study Based on Indian Citation Index. *DESIDOC J. Libr. Inf. Technol.*, 2020, **40**(3), 169-175. doi: 10.14429/djlit.40.3.15022.
4. Aria, M. & Cuccurullo, C. Bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics.*, 2017, **11**(4), 959-75. doi: 10.1016/j.joi.2017.08.007.
5. Wijetunge, P.; Silva, A. & Manatunga, P.K. Research productivity of the state universities of Sri Lanka, a case based on SciVal and the contribution of the libraries towards excellence. *J. Univ. Libr. Assoc. Sri Lanka.*, 2020, **23**(1), 91-118. doi: 10.4038/jula.v23i1.7968.
6. Chandani, J.G. & Wijayasundara, N.D. Visibility of University of Sri Jayewardenepura in Scopus. *In: National Conference on Library and Information Science, Sri Lanka Library Association (NACLIS 2019): Revaluing Libraries: National Conversation on Value of Libraries*, 27 June 2019, Colombo, 2019. pp. 108-109. https://www.slla.lk/images/stories/docs/activities/publications/proceedings/naclis2019_proceedngs.pdf. (Accessed on 10 September 2021).
7. Navaneethakrishna, S. Sri Lankan research output at international level-A picture from Scopus. *In: 2nd International Conference on Social Sciences. University of Kelaniya; Kelaniya (ICSS 2013) Culture, Globalisation and the Developing World*, 2013, Kelaniya, University of Kelaniya. 2013. p. 42. http://repository.kln.ac.lk/handle/123456789/3733?show=full. (Accessed on 10 September 2021).
8. Santhakumar, R.; Kaliyaperumal, K. & Louies, S. Scientometric profile of the University of Madras: The mother of south Indian Universities. *DESIDOC J. Libr. Inf. Technol.*, 2020, **40**(3), 185-91. doi: 10.14429/djlit.40.3.14844.
9. Garg, K.C. & Padhi, P. A study of collaboration in laser science and technology. *Scientometrics.*, 2001, **51**(2), 415-27. doi: 10.1023/A:1012709919544.
10. Ruiz, C.J. & Waltman, L. Field-normalised citation impact indicators using algorithmically constructed classification

- systems of science. *Journal of Informetrics.*, 2015, **9**(1), 102–17.
doi: 10.1016/j.joi.2014.11.010
11. Perianes, A.; Waltman, L. & Van Eck, N.J. Constructing bibliometric networks: A comparison between full and fractional counting. *Journal of Informetrics*, 2016, **10**(4), 1178-95.
doi: 10.1016/j.joi.2016.10.006.
 12. Ajiferuke, I.; Burell, Q. & Tague, J. Collaborative coefficient: A single measure of the degree of collaboration in research. *Scientometrics*, 1988, **14**(5-6), 421-433.
doi: 10.1007/BF02017100.
 13. University Grant Commission. Schemes of Recruitment/Promotion for Associate Professor/Professor. Colombo: University Grant Commission;2009. Available from: https://www.ugc.ac.lk/attachments/666_Circular916.pdf. (Accessed on 10 September 2021).
 14. Naheem, K.T. & Shibu, K.M. Authorship patterns and collaborative research in the ‘Journal of Knowledge and Communication Management’, 2011–2014. *J. Knowl. Commun. Manage.*, 2015, **5**(2), 203-211.
doi: 10.5958/2277-7946.2015.00016.9
 15. Garg, K.C.; Kumar, S. & Kinwar, D. Bibliometric Study of CSIR-Institute of Himalayan Bioresource Technology (CSIR-IHBT) during 1990–2019. *SRELS J. Inf. Manage.* 2020, **57**(6), 309-18.
doi: 10.17821/srels/2021/v58i3/164588.

CONTRIBUTOR

Mrs Thivya Janen is currently working as a Senior Assistant Librarian University of Jaffna, Sri Lanka. She obtained her Master in Library and Information from Bharathidasan University, Trichy, India. Her research interest includes Research Information Systems, Digital Libraries and Bibliometric.