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Research Productivity of the Faculty of Science, Annamalai University, Tamil Nadu: A Scientometric Study

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Abstract - **The paper presents the contribution of Science faculty of Annamalai University. It describes the year-wise growth and form-wise distribution of the research output. It studies the impact of research under different Science Departments of the Annamalai University and analyses the strong and weak areas of University research, collaborative nature of research in terms of the authorship pattern. The results show that there is a significant growth of research productivity in the Faculty of Science during the period of study with more multi authored papers.**

Keywords: **Annamalai University, Research Productivity of Faculty of Science, Scientometric Study**

I. Introduction

Universities are knowledge based organizations whose functions are largely confined to teaching and research. They are designed to operate to discover and disseminate knowledge by possessing significant and relevant expertise in all the disciplines. According to the latest statistics available, there are 483 universities in India today (39 Central Universities; 255 State Universities; 59 Private Universities; and 130 Deemed Universities).

II. Science Research In Indian Universities

A regressive trend has been observed in the past few years in Science education in Indian Universities. Science seems to be losing out to other disciplines, particularly the professional courses in attracting students. Universities have long abandoned the accent on research and have become mere teaching centers. Research aptitude in students is not properly developed during their course of study. Their curriculum is neither research neither oriented nor updated. For many reasons majority of teachers with doctoral degrees in science are unwilling to undertake research projects or collaborative research. The academic ambience persisting in many universities do not encourage the research pursuits of faculty. Remedial measures are necessary for rejuvenating the interest in science. For ensuring productivity, the research activities of the Universities are critically examined based on internationally accepted metrics such as the credentials of the faculty, Ph.Ds awarded, research publications, patents secured and recognition accorded via cited publications, major research grants and awards.

Scientometrics is now used in quantitative research assessment exercises of academic output and the measurement of science communication. Nalimov and Mulchenko defined Scientometrics as "the application of those quantitative methods which are dealing with the analysis of science viewed as an information process". Research publications are clearly one of the quantitative measures of the basic research activity in a country or an institution. Publication activity is taken as measure of 'scientific productivity'. It is expressed by the number of papers published by a selected unit in a given time. The institution, which generates a good number of the research papers in a particular field, is considered as a frontier institution in that field. Such studies help decision makers and policy planners in the respective field to make available adequate facilities and direct the research activities in proper direction.

Various studies have been conducted in the past analyzing the contribution and impact of individual organizations. Kaur and Aggrawal (2010) [1] brought out the results of a bibliometric study of research publications of department of Chemistry, Guru Nanak Dev University, Amritsar for the period 2002-2006. Gupta and Dhawan (2008) [2] studied growth and impact of research output of University of Mysore for the period of1996-2006.Balu Maharana, Supreeti Das and Sabitri Majhi described results of research productivity study of agricultural scientists at Central Rice Research Institute (CRRI), Cuttack. Findings of the study indicate that journal article (72.69%) is the predominant type of publication [3]. The present work is an attempt to study the research productivity; of Science faculty of Annamalai University for the period 2006-2010.The findings from this study would be useful to understand regional disparities in science research in the country.

The Annamalai University is one of the largest residential universities in the country founded by Hon'ble Dr. Rajah Sir Annamalai Chettiar. It was started as the Minakshi College in 1920, became University in 1929 and presently has 50 departments of study. It has student strength of about 40,000 pursuing different programmes of study. The University has nine departments (Table I) under the faculty of Science.

TABLE I DEPARTMENTS IN FACULTY OF SCIENCE

Departments in Faculty of Science	Year of Establishment
Mathematics	1929
Statistics	1955
Physics	1929
Chemistry	1929
Botany	1932
Zoology	1934
Centre of Advanced Study in Marine Biology	1961
Department of Earth Science	1953
Department of Biochemistry and Biotechnology	1994

III. OBJECTIVES OF THE STUDY

The main objectives of the study are:

a. To analyze the year-wise distribution of the research output of the faculty of Science of Annamalai University between 2006 to 2010;

b. To study the department-wise output of the faculty of Science and to identify strong and weak disciplines of Faculty of Science with reference to the research output;

c. To analyse the form-wise distribution of research output;

d. To analyse the authorship pattern of the research output;

e. To study the collaborative efforts by the academics of Annamalai University.

IV. METHODOLOGY OF THE STUDY

The present study uses five years publication output data from 2006-2010 to understand the broad characteristics of the research output of the science faculty of the university. The data for the study was taken from the annual report of the University from 2006-2010 which were then tabulated and analysed.

V. DATA ANALYSIS

Table II and Figure 1 show that year-wise growth rate of research output by the Science faculty of Annamalai University. It could be noted that during the five years of study, its publications output shows a steady rise, from 377 papers (19.37%) in 2006 to 457 papers (23.48%) in 2010.

TABLE II YEAR-WISE GROWTH OF RESEARCH OUTPUT

Year	Number of Research Output	Percentage	Cumulative Total Number of Research Output	Cumulative Percentage
2006	377	19.37	377	19.37
2007	398	20.45	775	39.82
2008	326	16.75	1101	56.57
2009	388	19.95	1489	76.52
2010	457	23.48	1946	100.00
Total	1946	100		

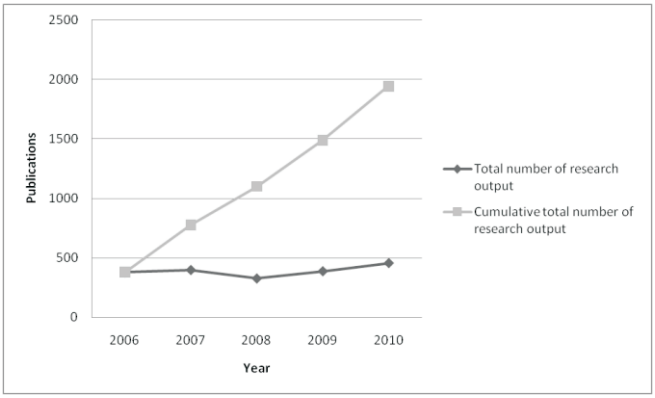

Fig.1 Year-wise growth of research output

There are nine departments under the Science faculty of the University. The publication output of the departments is given in Table III. The department of Biochemistry and Biotechnology top with 444 publication which is 22.82 % of the total contribution. The second ranks is to Centre of Advanced Study in Marine Biology with 401 publication (20.60%).The less number of publication is brought out by the Department of Statistics, i.e 103 publication (5.29%). Research output in pure science subjects like Zoology on the decline. With the recent developments in multidisciplinary subjects like biotechnology and the popular notion created by the media that bio-science is going to fuel the economy in the next century, research in those subjects are has showing relatively good productivity.

Table IV and Figure 2 reveal the source-wise distribution of research output. The results of the study points out 90 % of the publication are distributed as journal article, 5.04 % in conference proceedings, 4.52 % in seminar volumes.

Table V and Figure 3 show the authorship patterns of the research productivity. It could be noted that out of 1946 total publication 622 (31.96%) are single authored. Multy authorship predominates with two authors contributing 466 papers (23.95%), three authors contributing 330 papers (16.95%).

TABLE III DEPARTMENT-WISE DISTRIBUTION OF RESEARCH OUTPUT

S. No.	Department	No. of Research Output	Percentage	Cumulative Total No. of Research Output	Cumulative Percentage
1	Department of Mathematics	156	8.02	156	8.02
2	Department of Statistics	103	5.29	259	13.31
3	Department of Physics	152	7.81	411	21.12
4	Department of Chemistry	245	12.59	656	33.71
5	Department of Botany	187	9.61	843	43.32
6	Department of Zoology	120	6.17	963	49.49
7	Centre of Advanced study in Marine Biology	401	20.60	1364	70.09
8	Department of Earth Science	138	7.09	1502	77.18
9	Department of Biochemistry and Biotechnology	444	22.82	1946	100
	Total	1946	100		

TABLE IV FORM-WISE DISTRIBUTION OF RESEARCH OUTPUT

S. No.	Forms	No. of Research Output	Percentage	Cumulative Total No. of Research Output	Cumulative Percentage
1	Journal Articles	1760	90.44	1760	90.44
2	Conference Proceedings	98	5.04	1858	95.48
3	Seminar volume	88	4.52	1946	100
	Total	1946	100		

Table V and Figure 3 show the authorship patterns of the research productivity. It could be noted that out of 1946 total publication 622 (31.96%) are single authored. Multy authorship predominates with two authors contributing 466 papers (23.95%), three authors contributing 330 papers (16.95%).

As per the authorship pattern, there are 1647 papers which are single authored and only 652 which is multiple authored (Table VI) which points out that there is least collaboration in the research activities in the Science faculty of the Annamalai University. Extend of collaboration can be measured with the help of multi-authored papers. To measure the co-efficient is the ratio of the number of collaborative research papers during a certain period of time. As per the formula given by K.Subramanyan (1983) [4], for determining the degree of collaboration in a discipline, the value of collaboration will be between 0 and 1.

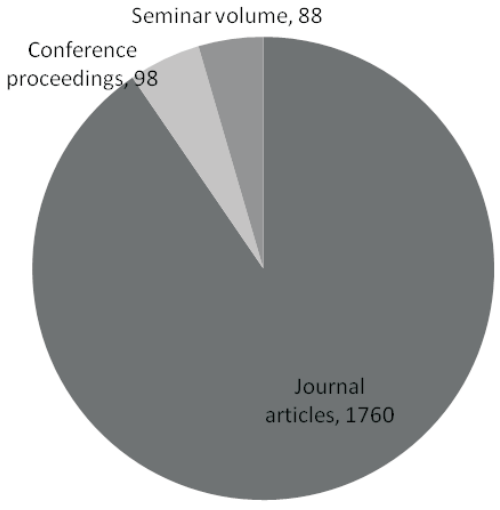

Fig. 2 Form-wise distribution of research output

TABLE V AUTHORSHIP PATTERNS

S.No.	Author	No. of Research Output	Percentage	Cumulative Total No. of Research Output	Cumulative Percentage
1	One	622	31.96	622	31.96
2	Two	466	23.95	1088	55.91
3	Three	330	16.95	1418	72.86
4	Four	284	14.59	1702	87.45
5	Above four	244	12.55	1946	100.0
	Total	1946	100.0		

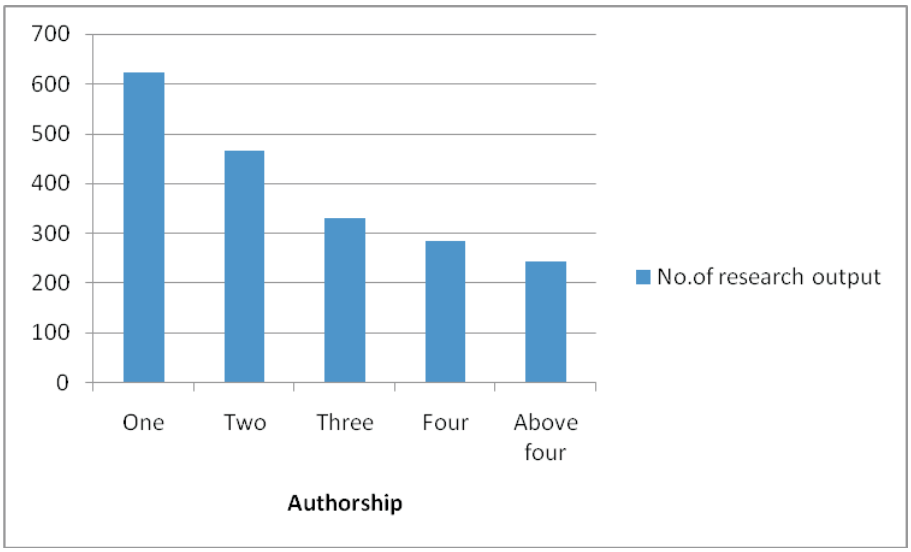

Fig. 3 Authorship patterns

To determine the degree of collaboration of publications, the number of single authored and multi-authored publications is calculated and is applied to the formula C= Nm/Nm + Ns.

C= Degree of Collaboration

Nm= Number of multi authored works

Ns = Number of single authored works

Here C = 622/1946

=0.319

Hence the Degree of Collaboration of publications of the Science faculty of the Annamalai University is 0.319.

TABLE VI COLLABORATION OF THE RESEARCH

S. No.	Authorship Patterns	No. of Research Output	Percentage	Cumulative Total No. of Research Output	Cumulative Percentage
1	Single Author	622	31.96	622	31.96
2	Multiple Author	1324	68.04	1946	100
	Total	1946	100		

VI. Findings And Suggestions

The research output shows a steady growth during the period of study which shows that the departments under the faculty of Science are successful in carrying out research activities. Those departments which show a decrease in the output needs to be further encouraged. Most of the papers are published as journal articles. There is also papers published in the seminar volume and conference proceedings which indicate that faculty are getting enough opportunities to present their papers in conferences and seminars. There is a paradigm shift to research productivity in Inter-disciplinary and multi-disciplinary areas like biotechnology. The authorship pattern shows that there are more multiple authored papers than single authored which indicates good collaboration of research in Science disciplines. The participatory research activities need to be encouraged which will further improve the quality of scientific research.

The research productivity can be increased by improving further the research environment, upgrading the infrastructural facilities, recruiting more qualified faculty and increasing the participation in research activities. More incentives, rewards, and encouragement should be given to the faculty members for publishing in high impact journals. In addition, faculty should be encouraged to conduct participatory research projects with other university departments so that their interaction with the outside world can be increased. Also, the existing library and information facilities in the university should be strengthened and access to electronic resources should be provided.

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