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SCIENCE AND TECHNOLOGY PUBLICATIONS OF STATE UNIVERSITIES IN THAILAND

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ABSTRACT

A survey has been made on papers resulted from research on science and technology carried out in Thai state universities from 1985-1994. Four databses, SCISEARCH, MEDLINE, CHEMICAL ABSTRACTS and BIOSIS, were used. Results show that 15 state universities have an average of 550 unique articles per year. Universities that consistently contributed to the standard journals during the ten-year period are Mahidol (51%), Chulalongkorn (18%), Chiang Mai (9.5%), Kasetsart (6.3%), Khon Kaen (5.9%) and Prince of Songkla (5.5%), the number of publications of each university ranges from 32 to 290 articles per year. The number of publications of most universities has increased significantly while almost no change is observed for the total number. The medical and science faculties have always been the major contributors.

INTRODUCTION

Number and quality of journal publications resulted from research and development (R&D) efforts are increasingly being used to evaluate scientific and technological (S&T) competitiveness of institutions and countries. Comparable places with R&D outputs have been ranked by discipline using the relative impact (citations/citable article/time) of the papers published. There are available broad-based electronic and printed databases which select journals for their accession lists based on utilization by respective professional users.

This article is a preliminary result from our research, supported by the Thailand Research Fund, to obtain the first definitive data on R&D outputs of Thailand from 1985-1994. The work was primarily an attempt at an overall status of the country's capability and capacity in S&T. State universities are featured because they account for close to 70% of the total publications. Figures for different universities are shown only for the sake of completion.

MATERIALS AND METHODS

Articles published using Thai state universities' addresses were obtained from 4 international databases, *viz.*, SCISEARCH, MEDLINE, CHEMICAL ABSTRACTS (CA) and BIOSIS. Figures for university teachers (professor, associate professor, assistant professor, lecturer etc.) were quoted from the Ministry of University Affairs and they represent the yearly average of the total number of such staff for each institution over the period studied. Articles appearing in SCISEARCH were assigned to this database only. All other articles counted in other 3 databases are uniquely listed in each of them. For SCISEARCH one

publication is attributed to each university mentioned in a publication, e.g., one joint publication with 3 universities would be counted as one publication by each of them. Yet, for the total tally of articles, multiple counting of the same articles (with multiple authors or addresses) was avoided.

RESULTS

All 4 tables show data over the 1985-1994 period. Table 1 shows that articles appearing in SCISEARCH represent 60% of all articles, while MEDLINE has 19% CHEMICAL ABSTRACTS (CA) has 7% and BIOSIS has 14%. Among the top 6 in number of publications, Mahidol (MU) contributed 51%, Chulalongkorn (CU)18%, Chiang Mai (CMU) 9.5%, Kasetsart (KU) 6.3%, Khon Kaen (KKU) 5.9% and Prince of Songkla (PSU) 5.5%. Figure 1 shows an increasing trend in number of publications during the ten-year period for most universities except for MU and KU's outputs which seem to fluctuate around a mean. Of the gross total of 5,741 articles claimable by the above universities, 232 were joint publications, leaving 5,509 unique articles. It was also found that the Faculties of Medicine contributed 47%, Science 30%, Agriculture 5.2%, Pharmacy 4.8% and Engineering 2.6% to the total publications in SCISEARCH. Figure 2 shows that the annual outputs in all these disciplines remained rather constant. A marked increase in medicine was observable from 1986-1990. We have elected to emphasize only medicine and science for their major role in overall contribution.

TABLE 1 Total publications of Thai state universities in 4 databases during 1985-1994.

University	SCI SEARCH*	MEDLINE*	CHEMICAL ABSTRACTS*	BIOSIS*	Total
1. Mahidol	1,742	655	77	427	2,901 (51%)
2. Chulalongkorn	632	171	99	129	1,031 (18%)
3. Chiang Mai	364	79	28	76	547 (9.5%)
4. Kasetsart	178	-	124	58	360 (6.3%)
5. Khon Kaen	198	89	9	46	342 (5.9%)
6. Prince of Songkla	139	96	36	44	315 (5.5%)
7. KMIT-Ladkrabang	53	-	7	1	61 (1.1%)
8. KMIT-Thonburi	40	-	10	-	50 (0.87%)
9. Srinakharinwirot	31	2	2	13	48 (0.84%)
10. Silpakorn	39	1	4	1	45 (0.78%)
11. Ramkamhaeng	14	-	3	1	18 (0.31%)
12. Maejo Institute	5	-	-	6	11 (0.19%)
13. Thammasart	5	1	-	-	6 (0.10%)
14. Burapa	5	-	-	-	5 (0.08%)
15. Ubon Ratchathani	1	-	-	-	1 (0.02%)
Total	3,446 (60%)	1,094 (19%)	399 (7%)	798 (14%)	5,741** (100%)

* Assignment to each databases was carried out according to Materials and Methods.

**Multiple counting of joint publications (232 articles) was eliminated, resulting in unique individual papers of 5509.

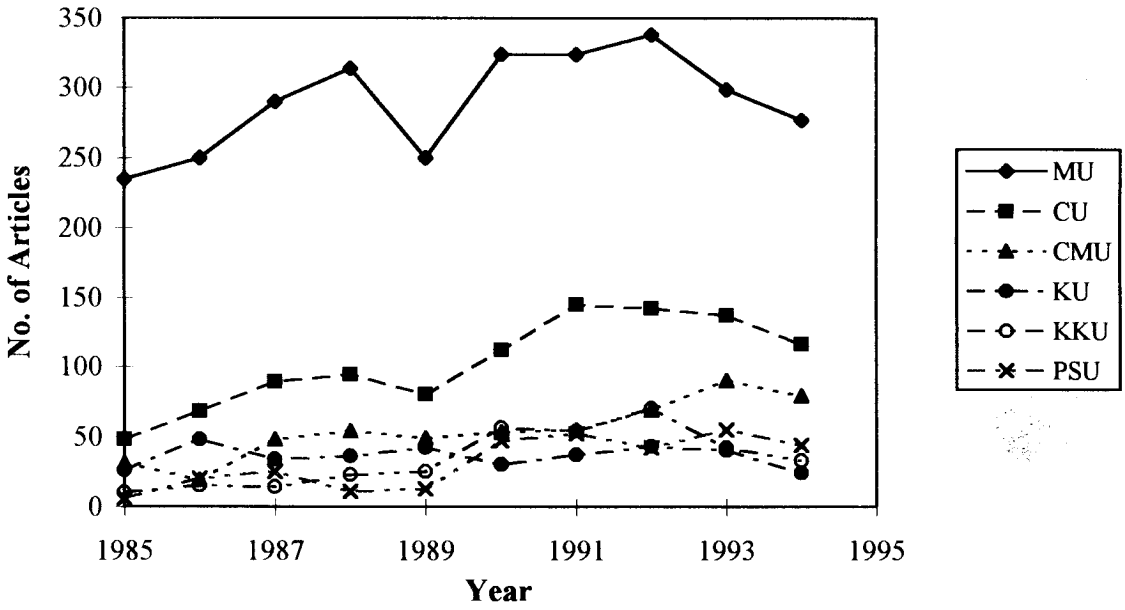

Fig. 1. Publications of Thai state universities during 1985-1994.

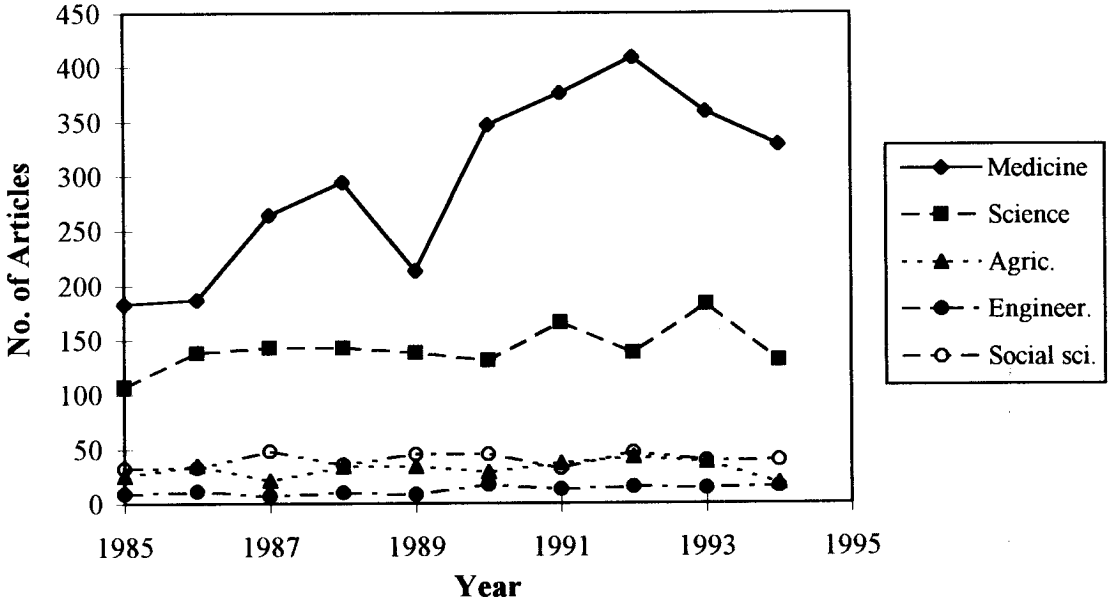

Fig. 2. Publications in medicine, science, agricultural science, engineering and social sciences during 1985-1994.

Table 2 shows, in the first column, the number of SCISEARCH-based publications in the state universities' medical schools; while all other universities have 1 school each, Mahidol has three. The numbers of publications/teaching staffmember/10 years are shown in the second column reflecting rather low productivity figures except for the Faculty of Tropical Medicine (MU) with 8.22. The latter also enjoys quite a high journal-based impact factor of 3.2 shown in the third column. The percentage of joint papers with foreign authors of the Faculty of Tropical Medicine is among the highest at 81% of all paper outputs from the same place (the fourth column).

TABLE 2 Publications in 4 databases of Faculty of Medicine of Thai state universities during 1985-1994.

University	Publications/ 10 yrs[1]	Publications/ 10 yrs/head[2]	Impact factor[3]	with foreign author(s) (%)
Mahidol				
- Med.-Ramathibodi Hosp.	571 (309)	1.37	1.74	16
- Med.-Siriraj Hosp.	664 (289)	1.18	2.43	33
- Tropical Medicine	633 (416)	8.22	3.21	81
Total	1,868 (1014)	1.77	2.49	44
Chulalongkorn	441 (249)	1.19	2.83	24
Chiang Mai	275 (172)	1.20	1.79	49
Khon Kaen	227 (125)	0.80	1.46	35
Prince of Songkla	157 (48)	0.81	2.12	18
Srinakharinwirot	14 (9)	0.24	1.21	0

[1]numbers in brackets are publications listed only in SCISEARCH

[2]number of publications in 10 years per teaching staffmember (annual average of total from 1985-1994)

[3]average journal-based impact factors of journals listed in SCISEARCH

Outputs of the Faculties of Science are shown in Table 3 with total publications in the first column, publications/teaching staffmember/10 years in the second column, journal-based impact factor in the third column and percentage of papers published with at least one foreign author in the fourth column. Again the overall productivity of teaching staff is not high at 3.14 for MU and 0.90 for CU, to mention the two with the highest number of publications. The extent of co-operation with foreign authors was high overall.

Table 4 shows SCISEARCH-based publications according to disciplines: chemical, biological, physical-mathematical and other sciences. Numbers in brackets are percentages of the overall contribution in each horizontal line. It is of interest to observe that, but for the weight of biological science contributions from MU, chemical papers would be greater in number than biological ones, which in turn, exceed physical-mathematical ones.

Finally, to indicate the trend in S&T publications, SCISEARCH-based data were gathered for the previous ten years, 1975-1984 (Table 5). Thus, for smaller and newer universities, there is a substantial increase in publications, whereas the percentage increase is smaller for the more established universities when the two ten-year periods are compared. Local funds and better research atmosphere may have contributed to the increases. While Thai citizens were granted 904 patents from 4233 applications during 1979-1994, Thai state universities were granted 1 out of 12 and other state agencies 1 out of 9 over the same period (the rest are still being considered).

TABLE 3 Publications in 4 databases of Faculty of Science of Thai state universities during 1985-1994.

University	Publications/ 10 yrs[1]	Publications/ 10 yrs/head[1]	Impact factor[2]	with foreign author(s) (%)
Mahidol	722	3.14	1.41	38
Chulalongkorn	362	0.90	1.19	58
Kasetsart	85	0.40	0.88	53
Chiang Mai	80	0.36	0.77	54
Prince of Songkla	75	0.34	0.69	47
Silpakorn	45	0.48	1.15	50
Srinakharinwirot	31	0.23	0.95	58
Khon Kaen	21	0.14	1.52	76
Ramkamhaeng	18	0.15	0.93	50
KMIT-Ladkrabung	8	0.21	0.81	-
KMIT-Thonburi	8	0.23	0.60	60
Burapa	5	0.06	0.24	66
Thammasart	4	0.06	0.24	-
Ubonratchathani	1	0.01	0.40	100

[1]number of publications in 10 years per teaching staffmember (annual average of total from 1985-1994)

[2]average journal-based impact factors of journals listed in SCISEARCH

TABLE 4 Publications in SCISEARCH in different disciplines in science of Thai state universities during 1985-1994.

University	Chemical Science	Biological Science	Physical-Mathematical Science	Others	Total
Mahidol	95 (17%)	418 (74%)	50 (9%)	-	563
Chulalongkorn	75 (36%)	95 (45%)	35 (17%)	4 (2%)	209
Kasetsart	28 (48%)	23 (40%)	7 (12%)	-	58
Chiang Mai	20 (38%)	12 (23%)	14 (27%)	6 (12%)	52
Prince of Songkla	28 (55%)	19 (37%)	4 (8%)	-	51
Silpakorn	29 (74%)	5 (13%)	5 (13%)	-	39
Srinakharinwirot	2 (9%)	9 (41%)	9 (41%)	2 (9%)	22
Khon Kaen	8 (57%)	4 (29%)	2 (14%)	-	14
Ramkamhaeng	10 (72%)	1 (7%)	3 (21%)	-	14
KMIT-Thonburi	3 (60%)	-	2 (40%)	-	5
KMIT-Ladkrabung	-	-	5(100%)	-	5
Burapa	1 (20%)	3 (60%)	1 (20%)	-	5
Thammasart	-	1 (25%)	2 (50%)	1 (25%)	4
Total	299 (29%)	590 (57%)	139 (13%)	13 (1%)	1041 (100%)
Total minus MU	204 (43%)	172 (36%)	189 (19%)	13 (2%)	478 (100%)

TABLE 5 Publications in SCISEARCH between 1975-1984 and 1985-1994.

University	1975-1984	1985-1994	% increase
1. Mahidol	1,481	1,747	18
2. Chulalongkorn	477	632	32
3. Chiang Mai	131	364	177
4. Khon Kaen	64	198	206
5. Kasetsart	51	178	249
6. Prince of Songkla	71	139	96
7. KMIT	66	93	41
8. Silpakorn	23	39	70
9. Srinakharinwirot	9	31	244
10. Ramkamhaeng	2	14	600
11. Thammasart	6	6	-
12. Maejo	-	5	
13. Burpa	-	5	
14. Ubon Ratchathani	-	1	
Total	2,381	3.446	45%

In addition to data in the 5 tables above, we wish to record here that in social sciences and humanities, of the 384 publications gleaned from 6 internationally recognized databases, MU provided 33%, CU 32%, CMU 12% and TU 9% of all such publications from Thai universities in the period studied. KKU, KU, PSU, RU (Ramkamhaeng), SWU (Srinakharinwirot), SU (Silpakorn) and SKU (Sukothaithammathiraj) accounted for between 1-4% of total.

DISCUSSION

The numbers in the tables above encompass many contributory factors and problems which should be recognized and rectified so that improvements can be made. To help improve the performance of each R&D place, one may have to look deeply into the role played by the author(s) of each address. First and/or principal authorship usually indicates a prominent role in the R&D process from project conception to getting the paper published in a standard journal. Joint works with local or foreign authors should be scrutinized to see whether authors in one's institution are capable of independent and/or substantive contribution. Thailand is different from North American and European countries in that foreign authors are more likely than not to be the principal investigators or initiators of the works published. Linkages between junior and senior authors should be traced through time and address change so that relative status and role can be determined. Impact factors of journals are a widely accepted indicator of the standards of the journals and hence the papers published in them. Our attempt at this standard criterion here should be considered as preliminary.

By the low level of publications/teaching staffmember/10 years we gather that there is untapped potential that can be raised. Professional scientists and promoters of science may be able to help in easing some uninitiated or inexperienced S&T graduates into being more productive R&D workers. Their skills and knowhow have to be exploited to the full or even channeled to fields hitherto unknown to them. Funds have to be sought and research opportunity must be created for these university teachers. They should be informed that research in science education is also publishable for instance.

From the data above it is our opinion that the overall R&D competitiveness of Thailand and Thai universities is still low. This is amply demonstrated by comparison with regional and international would-be competitors. In terms of percentage share of mainstream scientific journal articles, Thailand ranks below India, China, Taiwan, South Korea, Singapore, among others, in Asia, below South Africa and Egypt in Africa, and below Mexico and Brazil, in Latin America.[1,2] It almost ties with Nigeria, Kenya, Malaysia and Pakistan.[1,3] Among 8 countries in the Pacific Rim which includes Taiwan, South Korea, Hong Kong, Singapore, Thailand, Malaysia, Philippines and Indonesia, publications from Thailand represent 8% of total[4]. The good news is, in terms of impact, Thailand ranks first in the life sciences and a close second to Taiwan in medical sciences[5,6]. Although we cannot come close to comparing with top universities in Japan, UK and USA,[7,8] top Thai state universities are comparable to some respectable traditionally black universities in United States,[9] *e.g.*, Morehouse, Tuskegee, in terms of number and quality (impact) of publication in the life and medical sciences.

It is not our intention to discuss the relative performance in academic publications mainly because we lack in-depth studies of contributory and other factors. To rank our universities by the above numbers would be too divisive at the present time. However, we would like to assert our belief in promoting more and better R&D publications in strengthening our competitiveness for the next century. The promotion should be done without sacrificing other societal and commercial efforts. Regional and international competitors will compete with Thailand more and more openly, on all fronts, regardless of our parochial prejudices and problems. Naturally, not only should Thai universities' R&D capability and capacity be strengthened, other government R&D agencies and institutes must also be upgraded. The private sector, which should lead in the next one or two decades, must be quickly and earnestly induced to produce useful R&D works.

To most Thai people, the ultimate goals of R&D efforts should be commercialization and benefits to our society. However, these efforts need teamwork and organization, even when necessary personal needs are satisfied and supporting structures are available. Successful R&D must come from proactive planning and management throughout the course of each project. Members participating in the above endeavors may come from both the private and government sectors. Interim evaluations and changes may have to be made along the way.

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