Sri Lanka Science & Technology Statistical Handbook - 2006

NATIONAL SCIENCE FOUNDATION

SRI LANKA SCIENCE & TECHNOLOGY STATISTICAL HANDBOOK 2006

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FOREWORD

The National Science Foundation (NSF) and its predecessors, The National Science Council (NSC) and the National Resources Energy & Science Authority (NARESA) have been compiling statistical data on Science and Technology (S&T) relevant to Sri Lanka since 1970s and the last detailed publication was done in 2004.

Sri Lanka Science and Technology *Statistical* Handbook 2006, is the result of the National Research & Development (R&D) Survey carried out by the NSF in 2008 to provide the latest nationally comparable statistical data on Science and Technology. The data collection for the survey was done in collaboration with the University Grants Commission (UGC) that covered the university system and the Department of Census and Statistics that covered the Industrial sector in the country. The Science and Technology Policy Research Division (STPRD) of the NSF covered all the other sectors viz., government, private and non government organizations that carry out work related to Science and Technology either directly or indirectly.

The definitions and classifications used in the National R&D Survey 2006 and in this book are based on the recommendations concerning the International Standardization of Statistics on Science and Technology (UNESCO, 1978) and the Frascati Manual (OECD, 2002).

The indicators presented herein covers the input measures such as expenditure on research and development and available human resources plus the output measures such as patents, publications etc., in the first three chapters respectively. Based on the feed back and comments of our users, the last chapter of this booklet has also presented some useful indicators relevant to broader areas such as economic and development activities in the country along with our natural resources that were not available in the last publication.

For easy reference of our users, **Sri Lanka Science and Technology Statistical Handbook 2006** also includes both the highlights of the survey 2006 and general definitions used for the purpose.

Prof. Sirimali Fernando
Chairperson
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April 2009

PREFACE

This Data Booklet is an outcome of the National Research & Development Survey 2006 conducted by the Science & Technology Policy Research Division (STPRD) of the National Science Foundation, Sri Lanka. The S&T indicators and statistical data identified in this booklet are aimed at policy makers, planners, researchers, scientists and technologists requiring a quantitative overview of national S&T activities. This information is also useful for policy making purposes.

Sri Lanka Science and Technology Statical Handbook 2006 was produced by the research team of the STPRD under the close supervision and guidance of the Advisory Board. My special thanks go to the Scientific Officers, Dr. P. R. M. P. Dilrukshi, Mr. M.U.M. Anas and the Science and Technology Officer, Mr. Lasantha Weerasooriya, and to the other staff of the STPRD for their untiring efforts rendered towards the success of this project.

The co-operation and advice given by the Board of Management of the National Science Foundation, Sri Lanka is also gratefully acknowledged.

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April 2009

HIGHLIGHTS - 2006

- Sri Lanka has spent a total of Rs. million 5,119.19 (USD million 47.9) on R&D in 2006. This corresponds to 0.17% of the GDP of the country.
- The annual investment for R&D by the Government of Sri Lanka amounts to Rs million 3338.1 which is 65.2% of the total R&D investment and this value for 2004 was Rs million 2571.3 (67.5%)
- The Private Sector (business sector enterprises) contribution to GERD has significantly risen to 19% from 0.6% in 2004.
- The contribution of foreign funds for R&D shows a significant decline to 4.8% of GERD compared to 22.6% recorded in 2004.
- The R&D expenditure was 51% of total R&D investment in the State Sector organizations (R&D institutes and S&T service sector institutions)
- 58% of the R&D expenditure was spent on applied research followed by 22% on basic research and 20% on experimental development.
- The R&D expenditure for experimental research shows an increase from 7% in 1996 to 20 % in 2006.
- In 2006, 24% of the total R&D expenditure was spent on Agricultural Sciences while 22% on Natural Sciences and 21% were spent on Engineering & Technology respectively.
- Sri Lanka had around 44,000 total S&T workforce in 2006. 18% of this comprised scientists involved in the activities of research and development, research management and other related S&T services.
- Sri Lanka had 4,520 scientists and 2,471 technical personnel directly involved in Research and Development activities.

- 41.7% of the R&D scientists were employed in state sector S&T organizations; 32.7% in higher education sector and 25.6% in private sector organizations (business enterprises and NGOs).
- The highest number of research scientists (30%) were engaged in research in natural sciences. This was followed by medical sciences 27% ,agricultural sciences 19% and engineering and technology 16%.
- In 2006, 41.5 % of the total R&D scientists were female.
- The total number of Full-Time Equivalent researchers was 1,833 and 41.13% of this was represented by female scientists.
- The number of patents registered by the Patent Office of Sri Lanka was 129 and of that, 66 were registered by Sri Lankan residents and 63 were by non- residents.
- In 2006, 231 articles were published by the Sri Lankan scientists in the SCI cited journals and 60.2 % of that had foreign scientists as co-authors.
- The highest number (30%) of articles published in SCI cited journals was in the field of medical and health sciences followed by biological sciences (13%), chemical sciences (13%), agricultural sciences (12%) and physical sciences (11%).
- 1044 completed their post graduate degrees including 26 Ph.Ds, 38 M.Phils, 542, M.Sc. /M.Eng, 224 MD/MS and 214 postgraduate diplomas.

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3. Performance Indicators for Science and Technology

4. Key Socio-Economic Indicators

FINANCIAL RESOURCES FOR RESEARCH AND DEVELOPMENT

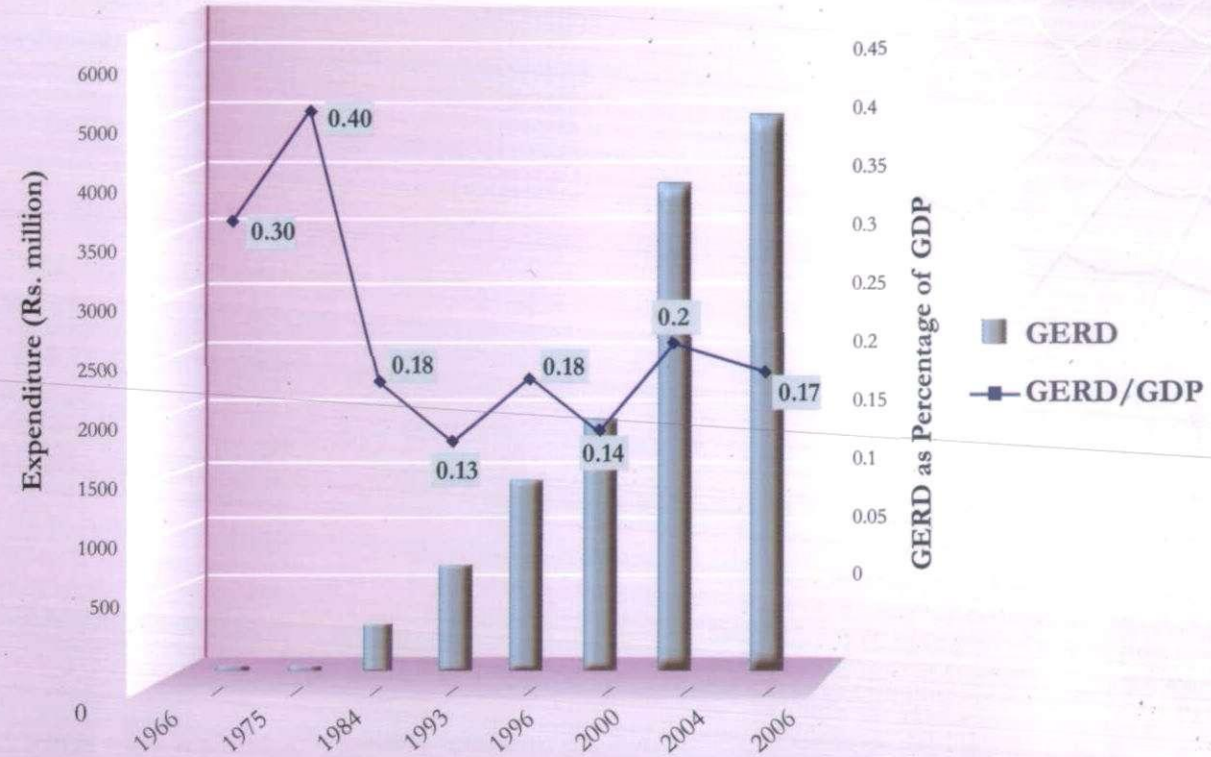
1.1 : Gross Expenditure on R&D (GERD) in Sri Lanka

Year	GDP Current Prices Rs.million	GERD Rs.million (US$)	GERD as Percent of GDP	Total Population million	GERD per million population Rs.million
1966	7,529	20 (4.2)	0.30	11.5	1.7
1975	11,100	45 (6.4)	0.40	13.5	3.3
1984	142,700	257 (9.7)	0.18	15.6	16.5
1993	499,800	649 (13.1)	0.13*	17.6	36.8
1996	769,900	1,410 (23)	0.18	18.3	77.0
2000	1,258,000	1,810 (22.9)	0.14*	18.4	98.4
2004	1,800,750	3,807 (40.9)	0.21	19.4	196.2
2006	2,939,000	5,119 (47.9)	0.17	19.8	258.5

Source : National R&D Surveys Sri Lanka 1996 (NARESA); 2000,2004 & 2006 (NSF)

* Estimates

Figure 1 : Gross Expenditure on R&D



1.2 : R&D Expenditure in selected countries

Country	Year	R&D Expenditure 000 PPP$	As percentage (%) of GDP	Per capita (PPP$)
Brazil	2005	13,057,225.70	0.82	69.88
Canada	2006	23,563,512.63	1.97	723.32
China	2006	86,758,233.48	1.42	65.68
Germany	2006	67,143,260.74	2.52	812.47
India	2004	14,956,223.18	0.69	13.38
Indonesia	2001	251,609.91	0.05	1.17
Israel	2006	7,689,762.19	4.53	1,129.18
Japan	2006	138,767,293.00	3.39	1,084.51
Malaysia	2004	1,661,347.41	0.59	65.94
Mongolia	2005	17,331.56	0.26	6.72
Myanmar	2002	48,964.44	0.16	1.05
New Zealand	2005	1,189,315.58	1.17	290.28
Pakistan	2005	1,486,576.28	0.44	9.40
Republic of Korea	2006	35,897,697.03	3.23	747.08
Russian Federation	2006	20,123,587.82	1.08	140.51
Singapore	2006	4,782,486.88	2.39	1,091.42
Sri Lanka	2004	115,524.90	0.19	6.08
Sweden	2006	11,867,333.68	3.82	1,307.23
Thailand	2004	1,055,221.76	0.26	16.87
United Kingdom	2006	36,035,852.84	1.79	595.52
United States	2006	343,747,500.00	2.61	1,135.08

Adapted from UNESCO Statistics 2006

1.3 : Science, Technology and Innovation indicators in selected countries 2002-2004

	GERD/ GDP 2002-04	GERD/ Business Enterprise	GERD % Government	GERD % Higher Education	High-Tech Exports as % of manufactured exports	R&D Researchers per million persons
China	1.44	62	27.0	11.0	27	633
India	1.11	23	74.6	2.4	11*	143**
Japan	3.15	77	9.3	13.7	24	5,085
Malaysia	0.69	65	20.0	15.0	58	294
New Zealand	1.16	62	29.0	29.0	10	2,593
Pakistan	0.24	-	80.0	20.0	1	88
Phillipines	0.11	61	22.0	17.0	74	-
Rep. of Korea	2.64	77	13.0	10.0	32	2,979
Thailand	0.26	47	22.0	31.0	3	289
Australia	-	54	19.0	28.7	14	3,446
Sri Lanka	0.21	0	61.0	33.5	NA	214

Source : Tim Turpin and V. V. Krishna (2007), Science, Technology Policy and the Diffusion of knowledge, Edward Elgar Publishing Ltd, U.K.
* for 2004-05 including software products : Source: Centre for studies in Science policy, Jawaharlal Nehru University, New Delhi.
** for 2000 : source : www.unesco.org/science/knowledge_societies.pdf
NA - Not available for 2002 - 2004

1.4 : National Expenditure on Research and Development (GERD) by Source of Funding 2006

Rs.million

Source of Funding	Recurrent	Capital	Total	GDP
Government	2,858.6	479.5	3,338.1	0.11
	(55.8 %)	(9.4%)	(65.2%)	
Private	302.7	672.3	975.0	0.03
	(5.9 %)	(13.1%)	(19.0%)	
Foreign	152.9	94.0	246.9	0.01
	(3.0 %)	(1.8 %)	(4.8%)	
Other	398.5	160.7	559.2	0.02
	(7.8 %)	(3.1 %)	(10.9%)	
Total	**3,712.7**	**1,406.5**	**5,119.2**	**0.17**
	(72.5%)	(27.5%)	(100.0 %)	

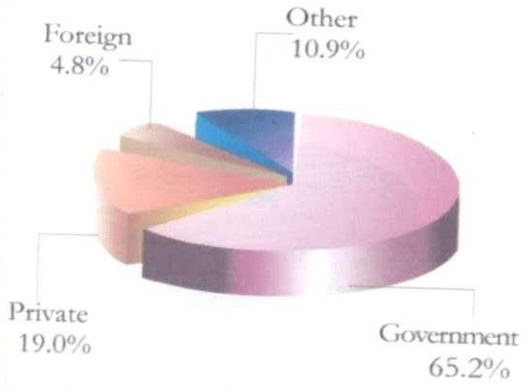


Figure 2

1.5 : National R&D Expenditure trends by Source of Funding 1996-2006

Rs.million

Source of Funding	1996	2004	2006
Government	981.0	2,571.3	3,338.1
	(69.6 %)	(67.5 %)	(65.2 %)
Private	21.5	21.9	975.0
	(1.5 %)	(0.6%)	(19.0%)
Foreign	324.5	861.8	246.9
	(23.0%)	(22.6%)	(4.8%)
Other	82.6	352.5	559.2
	(5.9%)	(9.3%)	(10.9%)
Total	**1,409.6**	**3,807.5**	**5,119.2**
	(100.0%)	**(100.0 %)**	**(100.0 %)**

Source : National R&D Surveys Sri Lanka 1996 (NARESA); 2004 & 2006 (NSF)

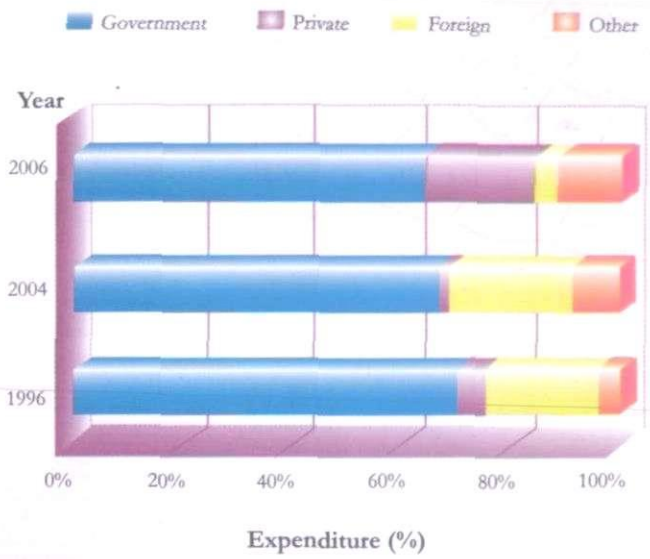


Figure 3

1.6 : Trend in R&D Expenditure (%GDP) by source of Funding 1996 - 2006

% GDP

Source of Funding	1996	2004	2006
Government	0.12	0.14	0.11
Private	0.00	0.00	0.03
Foreign	0.04	0.05	0.01
Other *	0.01	0.01	0.02
Total	**0.18**	**0.21**	**0.17**

Sources : National R&D Surveys Sri Lanka 1996 (NARESA); 2004 & 2006 (NSF)
*Other funds generated by the institution itself by providing services etc.

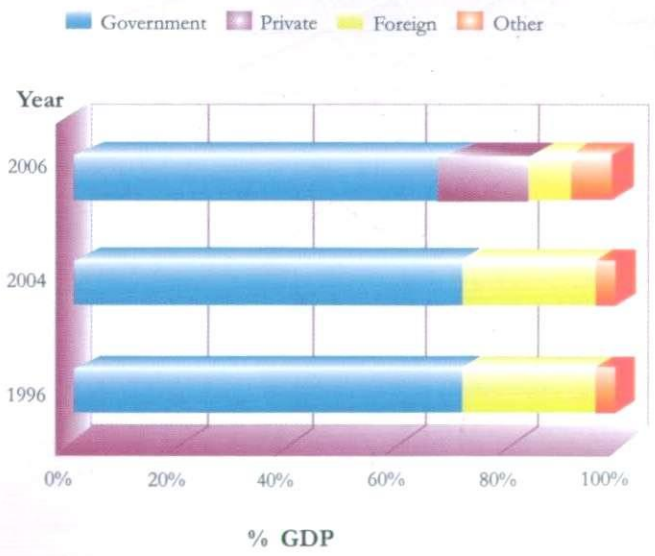


Figure 4

1.7 : National R&D Expenditure by Sectors

Rs.million

Sector	1996			2004			2006		
	Recurrent	Capital	Total	Recurrent	Capital	Total	Recurrent	Capital	Total
Higher Education	299.3	58.4	357.7 (25.4%)	1,150.0	127.6	1,277.6 (33.5%)	1,341.90	174.20	1,516.10 (29.6%)
State	827.2	203.2	1,030.4 (73.1%)	1,319.9	1,001.2	2,321.1 (61.0%)	2,065.80	558.90	2,624.70 (51.2%)
Private	3.0	18.5	21.5 (1.5%)	132.4	76.4	208.8 (5.5%)	304.90	673.50	978.40 (19.1%)
Total	**1,129.5 (80.1%)**	**280.1 (19.9%)**	**1,409.6 (100.0%)**	**2,602.3 (68.3%)**	**1,205.2 (31.7%)**	**3,807.5 (100.0%)**	**3,712.60 (72.5%)**	**1,406.60 (27.5%)**	**5,119.20 (100%)**

Source : National R&D Surveys Sri Lanka 1996 (NARESA); 2004 & 2006 (NSF)

Figure 5

1.8 : National R&D Expenditure by Nature of Research Activity

Rs.million

Nature of Research	1996		2004		2006	
	Amount	%	Amount	%	Amount	%
Basic Research	446.3	32.0	519.6	13.6	1,143.1	22.4
Applied Research	867.3	61.0	2,886.1	75.8	2,950.1	57.6
Experimental Development	96.0	7.0	401.8	10.6	1,026.0	20.0
Total	**1,409.6**	**100.0**	**3,807.5**	**100.0**	**5,119.2**	**100.0**

Source : National R&D Surveys Sri Lanka 1996 (NARESA); 2004 & 2006 (NSF)

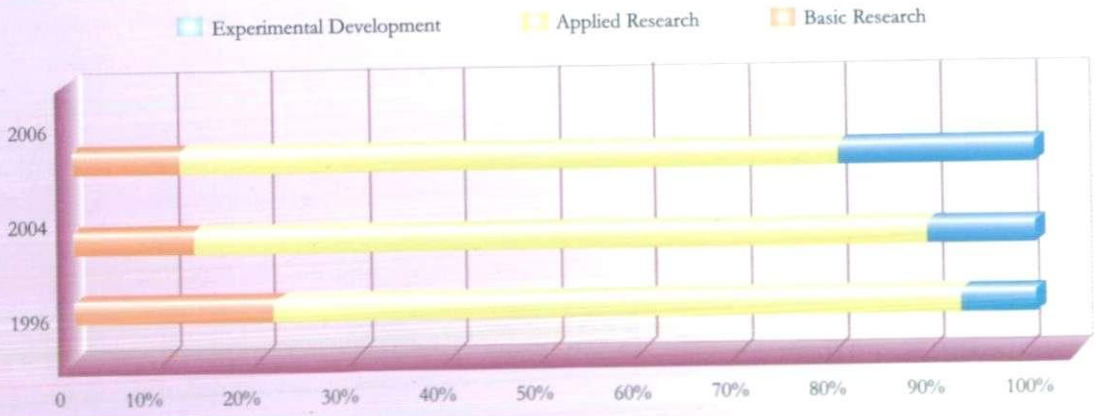


Figure 6

1.9 : National R&D Expenditure by Discipline 1996-2006

Rs.million

Discipline	Year		
	1996	2004	2006
Natural Sciences	318.3	627.6	1,148.7
	(22.6%)	(16.5%)	(22.4%)
Engineering & Technology	164.3	614.1	1,096.5
	(11.6%)	(16.1%)	(21.4%)
Medical Sciences	136.6	531.4	726.7
	(9.7%)	(14.0%)	(14.2%)
Agricultural Sciences	669.2	1,002.5	1,258.9
	(47.5%)	(26.3%)	(24.6%)
Social Sciences & Humanities	121.2	999.5	393.9
	(8.6%)	(26.2%)	(7.7%)
Other	-	32.4	494.7
		(0.9%)	(9.7%)
Total	**1,409.6**	**3,807.5**	**5,119.2**

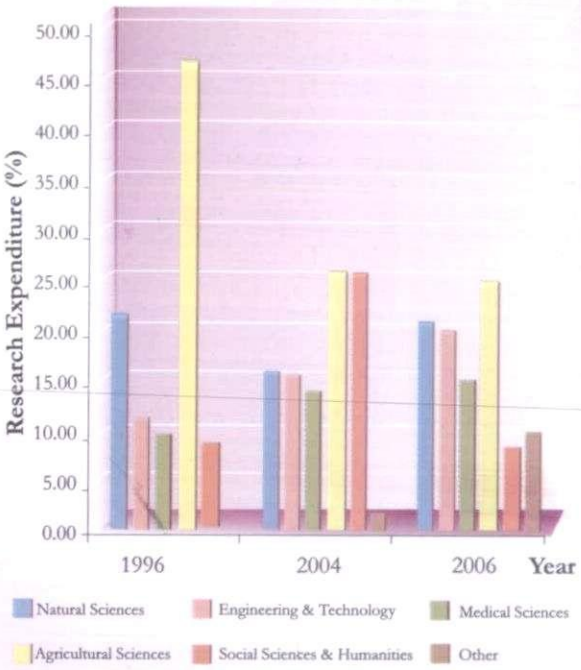


Figure 7

Source : National R&D Surveys Sri Lanka 1996 (NARESA); 2004 & 2006 (NSF)

HUMAN RESOURCES IN SCIENCE AND TECHNOLOGY PERSONNEL

2.1 : Science and Technology Personnel (STP) by Category

STP Category	2004			2006		
	Total number	Per cent of STP	Per million inhabitants	Total number	Percent of STP	Per million inhabitants
S&T Scientists	9,746	34.3	502.3	7,907	17.9	399.3
Technicians	12,302	43.3	634.1	9,803	22.2	495.1
Other Supporting Staff	6,384	22.4	329.1	26,358*	59.9	1,331.2
Total STP	**28,432**	**100.0**	**1,465.5**	**44,068**	**100.0**	**2,225.6**

Source : National R&D Surveys Sri Lanka 2004 & 2006 (NSF)
* includes skilled and unskilled supporting staff in Ceylon Electricity Board and Ceylon Transport Board that was not covered in the 2004 survey.

2.2 : R&D Manpower Resources in selected countries

Country	Year (data available)	Researchers per million population	Researchers (FTE) per million population
Cuba	2005	491	na
Cyprus	2005	1,858	890
Germany	2005	4,982	3,359
Hungary	2006	3,260	1,745
India	2003	157	na
Indonesia	2001	433	199
Ireland	2006	4,404	2,882
Japan	2006	6,836	5,546
Myanmar	2002	101	18
Nepal	2002	118	59
Malaysia	2004	917	503
Pakistan	2005	196	80
Republic of Korea	2006	5,340	4,162
France	2005	4,148	3,353
Thailand	2003	480	292
Mongolia	2005	671	na
Singapore	2006	6,727	5,713
South Africa	2005	819	361
Sri Lanka	2006	228	93

na=not available

Source : UNESCO Science Report 2006

2.3 : Number of S&T Personnel (STP) by Sector -2006

Sector	1996		2004		2006	
	STP	Percent	STP	Percent	STP	Percent
Higher Education	3,990	14.3	4,285	15.1	4,218	9.6
State	18,645	67.1	12,685	44.6	27,272	61.9
Private	5,165	18.6	11,462	40.3	12,578	28.5
Total	**27,800**	**100.0**	**28,432**	**100.0**	**44,068**	**100.0**

Source : National R&D Surveys Sri Lanka 1996 (NARESA); 2004 & 2006 (NSF)

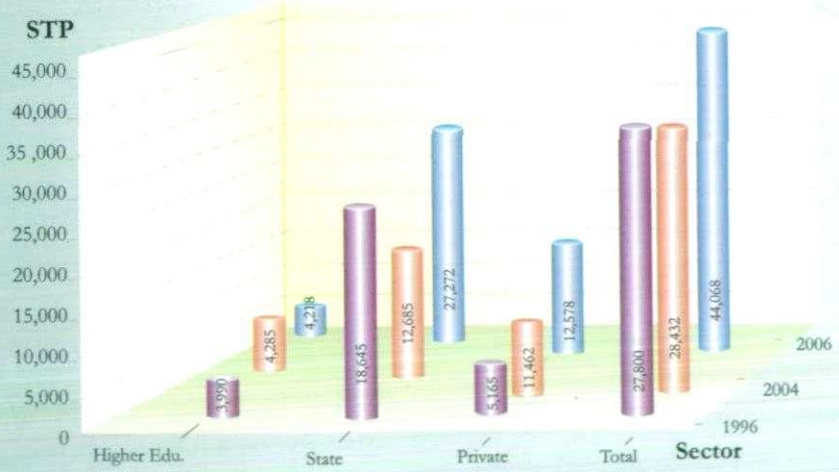


Figure 8

2.4 : Number of STP by Discipline 1996-2006

Discipline	1996		2004		2006	
	No	%	No	%	No	%
Natural Sciences	6,705	24.1	8,227	28.9	8,400	19.1
Agricultural Sciences	3,239	11.7	5,766	20.3	8,350	19.0
Engineering & Technology	12,631	45.4	8,244	29.0	21,038*	47.7
Medical Sciences	2,991	10.8	1,126	4.0	1,863	4.2
Social Sciences & Humanities	2,234	8.0	1,540	5.4	1,550	3.5
Other / Not Specified	-	-	3,529	12.4	2,867	6.5
Total	**27,800**	**100 .0**	**28,432**	**100.0**	**44,068**	**100.0**

Source : National R&D Surveys Sri Lanka 1996 (NARESA); 2004 & 2006 (NSF)
*wider coverage

Number of STP by Discipline 1996 - 2006

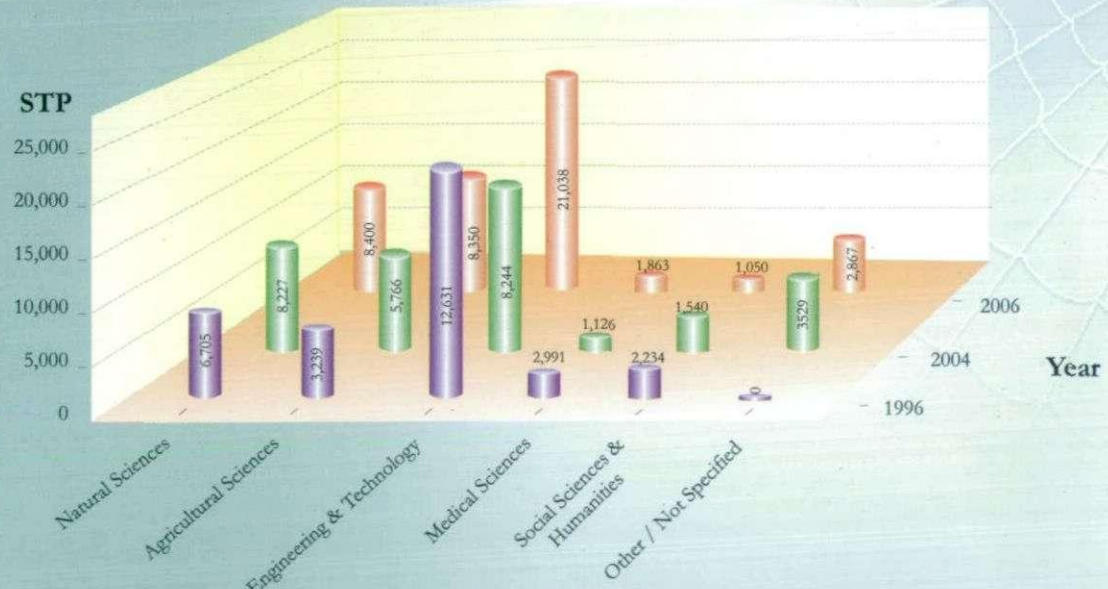


Figure 9

2.5 : Number of R&D Scientists (Head Count) by Sector

Sector	2004				2006			
	Scientists		Technicians		Scientists		Technicians	
	No.	%	No.	%	No.	%	No.	%
Higher Education	2,920	62.3	622	30.6	2,839	62.8	807	32.7
State	1,413	31.9	1,043	51.3	1,479	32.9	1,031	41.7
Private and NGO	269	5.8	369	18.1	202	4.5	633	25.6
Total	**4,602**	**100.0**	**2,034**	**100 .0**	**4,520**	**100.0**	**2,471**	**100.0**

Source : National R&D Surveys Sri Lanka 2004 & 2006 (NSF)

2.6 : Number of R&D Scientists (Head Count) by Discipline and Sex

Discipline	Head Count of R&D Scientists (2004)						Head Count of R&D Scientists (2006)					
	Male		Female		Total		Male		Female		Total	
	No	%	No	%	No	%	No.	%	No.	%	No.	%
Natural Sciences	1,032	35	696	43	1,728	37	698	26	645	34	1,343	30
Agricultural Sciences	569	19	288	18	857	19	507	20	335	17	842	19
Engineering & Technology	774	26	193	12	967	21	741	28	320	17	1,061	23
Medical Sciences	369	12	318	19	687	15	480	18	410	22	890	20
Social Sciences & Humanities	167	6	109	7	276	6	177	7	155	9	332	7
Other / Not Specified	63	2	24	1	87	2	39	1	13	1	52	1
Total	**2,974**	**100**	**1,628**	**100**	**4,602**	**100**	**2,642**	**100**	**1,878**	**100**	**4,520**	**100**

Source : National R&D Surveys Sri Lanka 2004 & 2006 (NSF)

2.7 : Educational Qualifications of R&D Scientists - 2006

Qualification	Male		Female		Total	
	No.	%	No.	%	No.	%
Ph.D.	796	30.0	367	20.0	1,163	25.7
M.Phil./ M.Sc.	710	26.0	540	29.3	1,250	27.6
B.Sc. + P.G. Diploma	101	3.7	82	4.5	183	4.0
B.Sc. (Special)	462	17.2	293	16.0	755	16.7
B.Sc. (General)	421	16.0	477	26.0	898	19.8
Other	193	7.1	78	4.2	271	6.2
Total	**2,683**	**100.0**	**1,837**	**100.0**	**4,520**	**100.0**

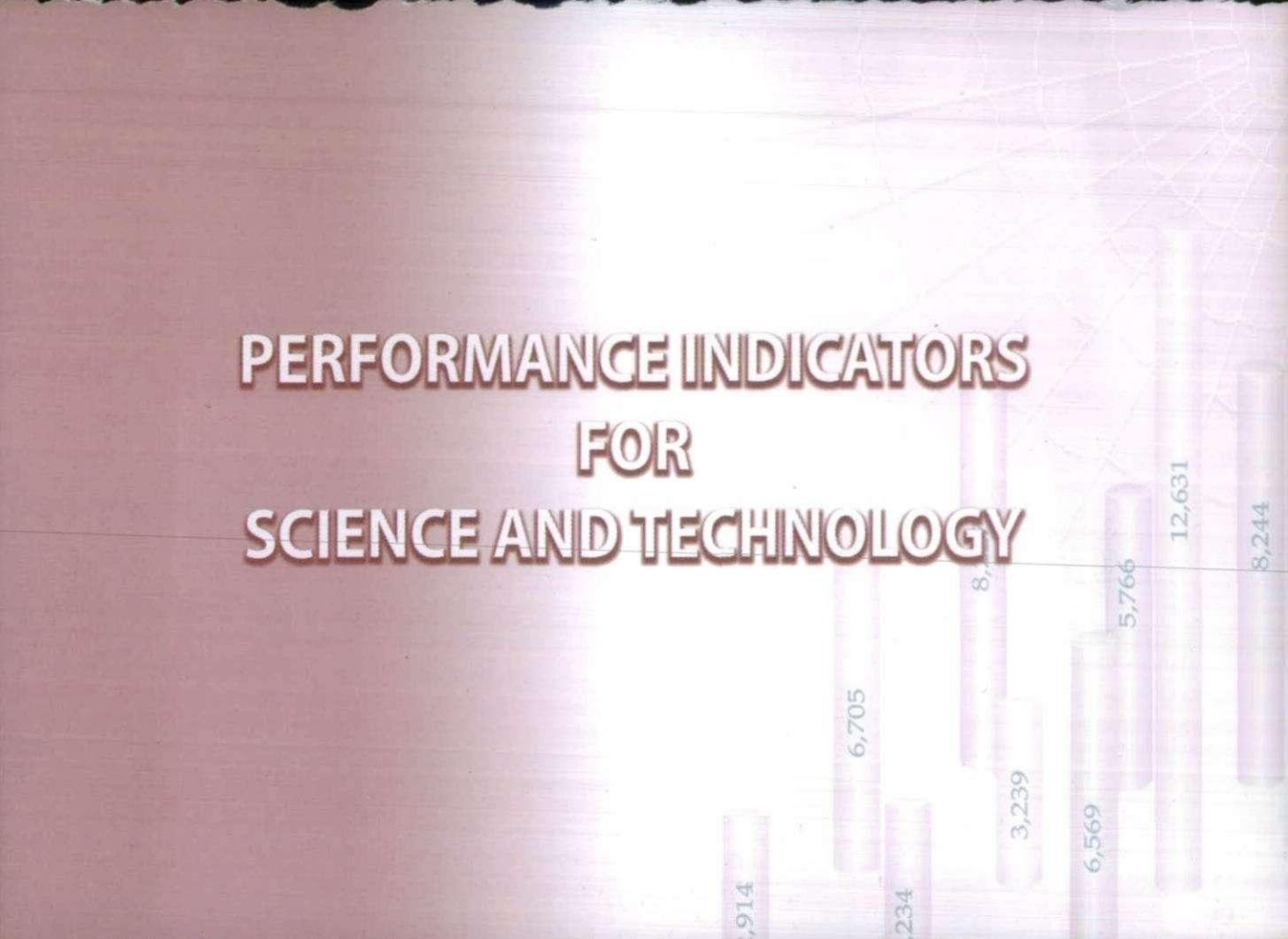
2.8 : Number of FTE of R&D Scientists by Sector - 2006

Sector	Full Time Equivalent of R&D Scientists			
	Male	Female	Total	% Female
Higher Education	406	303	709	16.5
State	516	406	922	22.1
Private & NGO	157	45	202	2.4
Total	**1,079**	**754**	**1,833**	**41.0**

2.9 : Number of FTE of R&D Scientists by Discipline - 2006

Discipline	Full Time Equivalent of R&D Scientists			
	Male	Female	Total	% Female
Natural Sciences	223	191	414	46
Agricultural Sciences	327	246	573	43
Engineering & Technology	274	134	408	33
Medical Sciences	122	95	217	44
Social Sciences & Humanities	96	75	171	44
Other / Not Specified	37	13	50	26
Total	**1,079**	**754**	**1,833**	**41**

PERFORMANCE INDICATORS FOR SCIENCE AND TECHNOLOGY



3.1 : Number of Patents registered locally during 1997 - 2006

Year	Resident	Non resident*	Total
1997	65	96	161
1998	44	97	141
1999	78	101	179
2000	59	69	128
2001	71	104	175
2002	62	56	118
2003	59	53	112
2004	99	91	190
2005	63	122	185
2006	66	63	129

Source : adapted from information of National Intellectual Property Office of Sri Lanka
* Foreign countries / individuals.

3.2 : Number of Patents registered by residents during the period 2003- 2006 by sector

Category	2003	2004	2005	2006
S&T Institutes	8	5	2	3
Higher Education Institutes	4	4	3	1
Private Institutes	8	13	8	4
Individuals	39	77	50	58
Total	**59**	**99**	**63**	**66**

3.3 : Distribution of Patents

Classification	Year					
	2002	2003	2004	2005	2006	Total
Dryers/Dehydration Technology	0	1	1	1	2	5
Food and Beverage Process Technology	2	4	5	8	9	28
Rubber Production and Processing Technology	3	0	2	0	1	6
Agricultural Systems and Development Technology	5	5	7	12	11	40
Construction Technology and Materials	1	3	4	6	5	19
Packaging and Packing Materials	1	1	7	2	1	12
Energy Saving/ Generating Devices	9	3	5	3	3	23
Process Technology - Manufacturing Sector	2	4	5	2	6	19
Process Technology - Miscellaneous	3	6	5	2	1	17
Innovations in Domestic Appliances/Utilities	19	7	13	4	5	48
Innovations in IT and Telecommunication & Other	7	11	19	21	16	74
Drugs, Cosmetics & Other Product Development	10	14	26	2	6	58
Total	**62**	**61**	**97**	**63**	**66**	**349**

Source : adapted from information of National Intellectual Property Office of Sri Lanka

3.4 : Number of Technological Innovations and New Processess Developed in 2001-2006

Type	2001 - 2002	2003 - 2004	2005 - 2006
Technological Innovations	39	70	72
New Processes Developed	22	45	52
High Technology Products Produced	24	44	38
Technology Transfer Activities	1,572	2,324	3,347

Source : National R&D Surveys Sri Lanka 1996 (NARESA); 2004 & 2006 (NSF)

3.5 : Other related indicators of S&T sector during 2005-2006

	National	International	Total
	2005 - 2006	2005 - 2006	
Book and book chapters	612	44	656
Journal Articles	3,769	1,950	5,719
Other publications	796	120	916
No. of Seminars presentations	3,494	698	4,192
Resource Persons at Workshops	4,017	115	4,132
No. of Training programs conducted for public	2,630	798	3,428
No. of Consultancies involved	3,813	904	4,717
No. of Special Awards received	63	7	70
Other Communications	16	4	20

3.6 : Main fields of Sri Lankan papers in SCI for years 2005 - 2006

	2005		2006	
	Total Number	%With foreign co-authorship	Total Number	%With foreign co-authorship
Agriculture	17	5	20	6
Biological Sciences	28	5	28	11
Molecular biology & Biotechnology	11	4	9	3
Chemical Sciences	25	5	20	5
Earth Sciences	16	4	9	3
Engineering & Technology	9	0	7	2
Environmental Sciences	10	2	10	3
Fisheries/ Aquaculture	7	2	1	0
Food Science	5	1	5	1
Forestry	5	2	12	5
Health Science	64	18	70	16
Mathematics	5	2	1	0
Nanotechnology	5	0	5	1
Physics	14	3	21	7
Social Sciences	12	3	11	2
Veterinary Sciences	6	2	4	1
Total	**239**	**58**	**233**	**66**

3.7 : Postgraduate output in 2004 and 2006

Degree	Year	Medical	Computer	Agriculture	Science	Engineering	Total
PG Dip.	2004	167	20	2	5	105	299
	2006	11	82	12	91	18	214
MSc./MEng.	2004	37	44	130	83	206	500
	2006	63	103	220	116	40	542
M.Phil.	2004	5	-	11	8	18	42
	2006	1	-	13	21	3	38
MS/MD	2004	203	-	-	-	-	203
	2006	224	-	-	-	-	224
Ph.D.	2004	2	-	1	4	2	9
	2006	1	-	4	21	-	26
Total	**2004**	**414**	**64**	**144**	**100**	**331**	**1053**
	2006	**300**	**185**	**249**	**249**	**61**	**1044**

Source : University Statistics 2006, UGC

3.8 : Number of SLAAS presentations at Annual Proceedings and Number of Scientists involved during 2002-2006

	No. of publications					No. of Scientists involved				
	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
A (Medical Sciences)	30	27	36	19	20	87	111	104	51	60
B (Agricultural Sciences)	98	95	118	35	47	49	241	135	78	104
C (Engineering)	59	24	28	9	20	23	70	60	16	29
D (Life Sciences)	89	52	61	29	31	97	114	105	71	63
E1 (Physical Sciences)	43	24	27	15	33	87	44	71	32	56
E2 (Chemical Sciences)	57	44	23	14	25	90	95	59	32	64
F (Social Sciences)	34	31	41	43	48	52	65	93	76	67
Total	**410**	**297**	**334**	**164**	**224**	**485**	**740**	**627**	**356**	**443**

Source : SLAAS proceedings 2002-2006

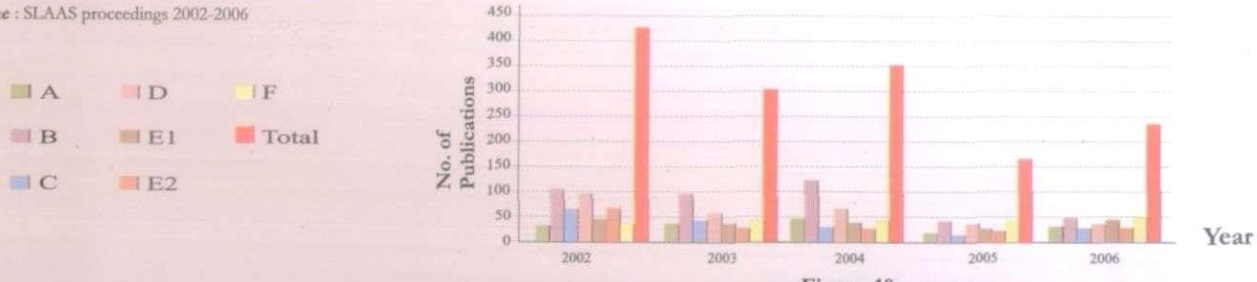


Figure 10

3.9 : Performance of NSF Research Grants Scheme 2006

Category	(2006) by Discipline					
	Natural Sciences	Agriculture	Engineering	Medical Sciences	Social Sciences	Total
Completed Grants	18	02	02	02	08	32
Total Expenditure in Rs. million	13.99	1.15	4.78	0.9	1.2	22.02
Masters & Doctoral Degrees	02	-	-	07	05	14
Publications (Foreign)	16	02	02	03	03	26
Publications (Local)	05	05	03	-	07	20
Other Communications	83	03	06	02	02	96

Source : NSF Annual Reports & National R&D Survey 2006

KEY SOCIO-ECONOMIC INDICATORS

4.1 : Demography

Item	2000	2002	2004	2006
Total Population, '000	19,359*	19,007*	19,462*	19,886*
0-14 Years	6,815	5,062	5,185	5,185
15-54 Years	10,714	11,410	11,678	11,678
55 Years and Over	1,830	2,535	2,599	2,599
Density of Population, Persons per Sq. km.	295	303*	310*	317*
Total Labour Force	6,827	7,145	7,654	7,312
Labour Force Participation rate	50.3	50.3	48.9	51.2
Unemployment Rate		8.8	7.7	6.5
Growth of Population %	1.3	1.2	1.2	n.a.
Crude Birth Rate, per 1,000 Population	18.4	19.1*	18.5*	18.8**
Crude Death Rate, per 1,000 Population	6.1	5.8*	5.8*	6.6**
Rate of Natural Increase, per 1,000 Population	12.3	13.3	12.7	12.9
Net Migration Rate, per 1,000 Population	1.5	-0.9	-1.2	-1.5**
Infant Mortality Rate, per 1,000 Live Births	13.3	11.2	12.0	n.a.

Source : Department of Census and Statistics, Sri Lanka 2007

* Provisional data

** Values represent 2005 statistics

n.a. - not available

4.2 : Human Development Indicators – Comparative Statistics

Indicator		Sri Lanka	India	Pakistan	Bangladesh	Malaysia	Singapore	UK	Japan
Life expectancy at birth (2000 - 2005)		76.1	63.7	64.6	61.3	73.7	79.4	79.0	82.3
Human Development Index (2005)		0.743	0.619	0.551	0.547	0.811	0.922	0.946	0.953
GDP per Capita (US$) 2005		4,595	3,452	2,370	2,053	10,882	29,663	33,238	31,267
Health Expenditure (*PPP US$) 2004		163	91	48	64	402	1,118	2,560	2,293
Health Expenditure (% of GDP) 2004	Public	2.0	0.9	0.4	0.9	2.2	1.3	7.0	6.3
	Private	2.3	4.1	1.8	2.2	1.6	2.4	1.1	1.5
Education Expenditure (% of GDP) 2002 - 2005	Public	2.9**	3.8	2.3	2.5	6.2	3.7	5.4	3.6
Physicians (per 100,000 people) 2000 - 2004		55	601	74	26	70	140	230	198
Adult Literacy Rate (% ages 15 and above) (1995 - 2000)		90.7	61.0	49.9	47.5	88.7	92.5	-	-

Source : Human Development Report 2007/2008 , UNDP;
* PPP – Purchasing Power Parity
**University statistics 2007, UGC

4.3 : Trends in Economic Activity in Sri Lanka

Period	Agriculture (%)	Industry (%)	Services (%)
1951-1960	42	17	40
1961-1970	35	18	47
1971-1980	29	27	44
1981-1990	27	27	46
1991-2000	23	27	50
2001-2003	20	26	54
2004-2006	13	28	59

Source : Central Bank of Sri Lanka 2004 - 2007

Trends in Contribution to Sri Lankan Economy by different sectors

4.4 : Economic Activity in South Asia, 2001 and 2006

	Agriculture		Industry		Services	
	2001	2006	2001	2006	2001	2006
South Asia	24.2	19.2	25.0	26.7	50.8	54.2
Afghanistan	-	30.9	--	26.2	--	42.9
Bangladesh	25.0	21.8	26.2	29.0	48.8	49.2
Bhutan	27.9	21.3	36.5	38.5	35.6	40.2
India	24.0	18.5	25.0	26.6	51.0	54.9
Maldives	9.2	8.6	14.5	15.5	76.3	75.9
Nepal	38.0	38.8	23.5	22.4	38.5	38.8
Pakistan	24.9	21.3	23.8	25.9	51.3	52.8
Sri Lanka	20.1	16.8	27.4	27.0	52.5	56.2

Source : South Asia Economic Report 2007

4.5 : Gross National Product by Industrial Origin of Major Economic Activities

Rs. million

Sector	Current Price			Constant Prices (2002)		
	2004	2005	2006	2004	2005	2006
Agriculture	262,271	289,906	333,114	237,536	241,851	257,131
Agriculture, Livestock and Forestry	228,760	270,679	297,863	213,246	228,006	235,872
Fishing	33,511	19,227	35,251	24,290	13,846	21,260
Industry	598,359	740,448	900,479	505,602	545,981	590,298
Mining and Quarrying	30,129	35,932	46,202	24,439	28,791	35,769
Manufacturing	391,421	478,611	564,987	330,459	350,886	370,355
Electricity, Gas and Water	49,116	57,908	72,457	40,445	46,108	52,926
Construction	127,692	167,999	216,833	110,259	120,196	131,248
Services	1,230,211	1,422,428	1,705,064	1,084,459	1,153,839	1,243,119
Wholesale and Retail Trade	513,498	569,255	659,597	451,633	480,402	514,511
Hotels and Restaurants	11,763	14,218	16,646	10,691	9,186	9,411
Transport and Communication	240,307	287,491	344,909	210,495	230,597	259,546
Banking, Insurance and Real Estate etc.	178,119	205,322	266,972	153,143	163,863	177,817
Ownership of Dwellings	77,676	88,759	103,201	70,008	70,749	71,533
Government Services	163,474	206,497	257,837	146,030	153,866	161,611
Private Services	45,375	50,886	55,902	42,460	45,177	48,689
Gross Domestic Product	2,090,841	2,452,782	2,938,656	1,827,597	1,941,671	2,090,548
Gross National Product	2,070,109	2,422,733	2,898,232	1,809,475	1,917,884	2,061,791

Source : Central Bank of Sri Lanka 2007

4.6 : Realised Investments through BOI Projects in 2005 - 2006

Category	Number of Projects		Foreign Investment Rs.million		Total Investment Potential Rs.million	
	2005	2006	2005	2006	2005	2006
Food, beverages and tobacco products	147	142	16,765	20,375	27,105	32,174
Textiles, wearing apparel and leather products	492	481	30,278	36,970	45,879	55,767
Wood and wood products	25	26	5,619	5,715	5,877	6,111
Paper and paper products	30	29	788	747	1,771	1,769
Chemical, petroleum, coal, rubber and plastic products	144	135	19,042	21,931	28,516	33,447
Non-metallic mineral products	64	65	9,621	11,400	17,942	19,792
Basic metal products	-	-	-	-	-	-
Fabricated metal products, machinery, and transport equipment	83	84	9,827	13,153	12,383	16,424
Manufactured products (n.e.s.)	156	154	8,403	10,750	11,534	14,487
Services	793	856	133,180	164,325	229,122	288,046

Source : Central Bank of Sri Lanka 2007

4.7 : Composition of Exports 2004 - 2006

Rs. million

Item	2004	2005	2006
Industrial Exports (Total)			
Textiles and Garments	285,172	291,087	320,829
Petroleum Products	10,133	13,169	19,580
Rubber Based Products	28,727	39,693	44,529
Diamonds	24,950	26,594	32,440
Agricultural Exports			
Tea	74,897	81,482	91,667
Rubber	5,155	4,724	9,674
Coconut Products	11,453	11,400	12,898
Minor Agricultural Products	16,446	18,439	20,242
Gems	10,939	12,088	10,714
Other	6,738	10,134	7,198
Total	**583,967**	**638,276**	**716,579**

Source : Central Bank of Sri Lanka 2007

4.8 : Composition of Imports 2004 - 2006

Rs. million

Item	2004	2005	2006
Consumer Goods	**146,073**	**151,021**	**185,461**
Rice	6,186	1,554	577
Flour and Sugar	11,339	16,503	23,577
Milk and Milk Products	12,338	13,401	17,761
Fish and Fish Products	5,849	6,989	9,647
Other Food Products	24,736	22,963	27,294
Other Consumer Goods	85,626	89,611	106,607
Intermediate Goods	**489,688**	**549,004**	**640,810**
Petroleum	122,732	166,562	215,168
Textiles	153,476	153,957	160,987
Fertiliser	10,902	13,552	17,036
Chemical Elements, Dyeing and Colouring Materials	26,707	31,348	34,555
Other Intermediate Goods	175,871	183,585	213,064
Investment Goods	**169,096**	**188,061**	**233,637**
Machinery and Equipments	86,709	86,567	110,853
Building Materials and Transport Equipments	66,717	83,710	94,750
Other Investment Goods	15,670	17,785	28,035
Unclassified Imports	6,280	3,272	6,781
Total Imports	**811,138**	**891,359**	**1,066,689**

Source : Central Bank of Sri Lanka 2007

4.9 : Key Indicators on Household Income 1985 - 2005

Variable	Units	Survey period				
		1985/86	1990/91	1995/96	2002	2005
Mean household income per month	Rs.	2012	3549	6476	12803	20048
Median Household income per month	Rs.	1322	2547	3793	8482	13617
Per capita income per month	Rs.	395	724	1439	3056	4896
Real income (based year 1980/81)	Rs.	1195	1125	1177	1362	1649
Income receivers mean income per month	Rs.	941	1819	3367	6959	10563
No of income receivers per household	Nos.	2	2	1.8	1.8	1.9
Household size	Nos.	5.1	4.9	4.5	4.2	4.1
Monetary income per month per household	Rs.	1334	2963	5264	10386	17089
Non monetary income per month per household	Rs.	678	586	1212	2419	2959
Gini coefficient of household income		0.46	0.43	0.46	0.47	0.47
Gini coefficient of household expenditure		–	–	0.36	0.41	0.4
Gini coefficient of income receivers income		–	0.52	0.52	0.53	0.55
Mean household expenditure per month	Rs.	2079	3905	6525	13147	19151
Expenditure on food and drink	Rs.	1198	2377	3552	5848	7593
Expenditure on non food items (excluding liquor and tobacco)	Rs.	802	1384	2753	6993	11079
Expenditure on Liquor & Tobacco	Rs.	79	144	219	306	479
Food Ratio (as a percentage)	%	57.6	64.6	54.4	44.5	39.6

Source : Household Income and Expenditure Survey - 2006/07, Department of Census and Statistics, Sri Lanka

4.10 : Salient Features of Telecommunications and Postal Services 2003 - 2006

	2003	2004	2005	2006
Telecommunications Services				
1.Fixed access services				
Wirelines in Service (No.)	817,750	860,468	919,040	909,894 (a)
Wireless Access (No.)	116,021	130,771	324,953	974,184
Telephone Density (Telephones per 100 persons)	4.88	5.09	6.26	9.53
2. Other Services				
Cellular Phones (No. of Subscribers)	1,393,403	2,211,158	3,361,775	5,412,496
Public Pay Phones (No. of Booths)	6,440	6,095	6,285	7,561
Radio Paging Services (No. of Subscribers)	2,851	828	n.a.	n.a.
Internet & Email (No. of Subscribers)	85,500	93,300	115,000	130,000
Postal Services				
1. Delivery Areas (No.)	6,729	6,729	6,729	6,729
2. Post Offices (No.)	4,630	4,711	4,704	4,727
Public	4,050	4,049	4,041	4,043
Private	580	662	663	684
3. Area Served by a Post Office (Sq. Km.)	14.1	13.9	13.9	13.8
4. Population Served by a Post Office (No.)	4,084	4,100	4,100	4,167
5. Letters per Inhabitant (No.)	24	24	25	24

Source : Central Bank of Sri Lanka 2007
(a) Wire lines declined in 2006 due to shift of some subscribers to CDMA

4.11 : Employment by Economic Activity (a)

Sector	Persons (000')		Percentage of Employment	
	2005(b)	2006	2005	2006
Agriculture	**2,059**	**2,287**	**30.3**	**32.2**
Industry	**1,787**	**1,890**	**26.3**	**26.6**
Manufacturing	1,293	1,363	19.0	19.2
Construction	494	527	7.3	7.4
Services	**2,941**	**2,928**	**43.3**	**41.2**
Trade and hotels etc.	932	1,084	13.7	15.3
Transport, Storage and Communication	448	430	6.6	6.1
Finance, Insurance and real estate	226	221	3.3	3.1
Personal Services and other	1,335	1,192	19.7	16.8
Total employment	**6,788**	**7,105**	**100.0**	**100.0**

Source: Department of Census and Statistics
(a) Data exclude both Northern and Eastern Provinces.
(b) Quarterly Report of the Labour Force Survey (August 2005)

4.12 : Statistics on Secondary Education 2003 - 2006

Item	2003	2004	2005	2006
General Education				
1. Schools (No.)	10,473	10,501	10,461	10,461
1.1Government Schools	9,790	9,765	9,723	9,714
o/w National Schools	323	324	324	327
1.2 Other Schools	683	736	738	747
Private	85	85	85	93
Pirivenas	598	651	653	654
2. Students (No.)	4,098,465	4,028,186	4,103,512	4,000,714
2.1 Government Schools	3,941,685	3,870,628	3,942,077	3,837,548
2.2 Other Schools	156,780	157,558	161,435	163,166
Private	101,047	100,683	106,262	107,874
Pirivenas	55,733	56,875	55,173	55,292
3. New Admissions (No.)	316,344	303,269 (a)	319,078 (a)	322,431 (a)
4. Teachers	196,588	197,697	199,715	217,369
4.1 Government Teachers	186,695	187,337	189,234	206,559
4.2 Others	9,893	10,360	10,481	10,810
5. Student/Teacher Ration (Government Schools)	21	21	21	19
6. Expenditure on Education (Rs.mn.) (b)	39,116	42,340	63,557	78,344
6.1 Current	31,673	33,792	50,697	61,144
6.2 Capital	7,443	8,548	12,860	17,200
7. Expenditure as a % of GDP	2.15 (c)	2.03 (c)	2.59 (c)	2.67 (c)

Source: Ministry of Education, University Grants Commission, Ministry of Finance and Planning, and Central Bank of Sri Lanka
(a) Government schools only; (b) Government expenditure on General and Higher Education
(c) Data based on estimates compiled by the Department of Census and Statistics

4.13 : Statistics on University Education

Item	2003	2004	2005	2006
University Education				
1. Universities (No.)	13	13	15	15
2. Students (No.) (e)	64,191	64,801	66,386	65,206
3. Lecturers (No.)	3,543	3,725	3,875	4,016
4. Number Graduating	10,730(f)	10,525(g)	7,154(h)	11,713(i)
4.1 Art and oriental Studies	3,456	3,366	1,652	4,405
4.2 Commerce & Management Studies	2,121	3,091	1,436	2,198
4.3 Law	307	166	345	327
4.4 Science	1,876	1,323	1,250	2,348
4.5 Engineering	652	984	755	809
4.6 Medicine	1,273	964	805	896
4.7 Dental Surgery	74	84	74	123
4.8 Agriculture	394	388	554	430
4.9 Veternary Science	61	42	74	64
4.10 Architecture & Quantity Surveying	81	69	59	13
5. New Admissions for Basic Degrees (No.)	25,471(j)	13,396	14,520	16,585

Source: University Grants Commission; Ministry of Finance and Planning ; and Central Bank of Sri Lanka
(e) In all Universities, excluding the Open University of Sri Lanka
(f) Including Fine Arts (359) and Ayurvedic/Unani/Sidda Medicine (76)
(g) Including Ayurvedic/Unani/Sidda Medicine (48)
(h) Including Ayurvedic/Unani/Sidda Medicine (134) and Computer SC/IT/ICT/MIT (16)
(i) Including Computer SC/IT/ICT/MIT (100)
(j)Qualified students from two GCE (A/L)

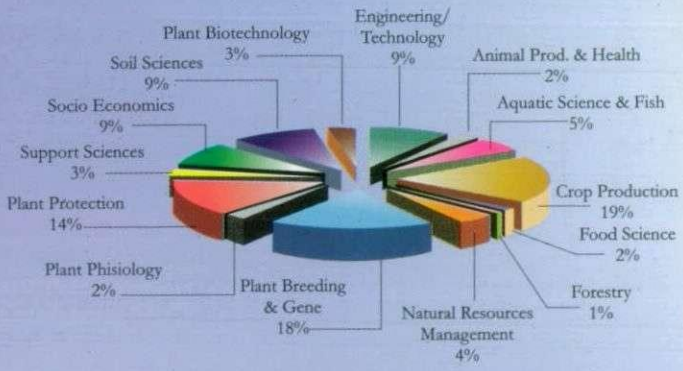
4.14 : Salient Features of Health Services

Item	2003	2004	2005	2006
1.Hospitals (Practicing Western Medicine) (No.)	606	598	606	604
2.Beds (No)	61,808	60,328	61,937	62,749
3.Central Dispensaries (No)	387	375	397	397
4.Doctors (No)	8,342	8,749	9,070	10,526
5.Asst.Medical Practitioners (No)	1,289	1,276	1,260	1,274
6.Nurses (No)	16,711	17,316	20,332	20,912
7.Attendants (No)	6,880	6,696	6,701	7,129
8.Indoor Patients (No.'000)	3,993	4,242	4,345	4,426
9.Outdoor Patients (No.'000)	43,765	43,392	42,483	41,430
10.Ayurvedic Doctors (No.) (a)	16,799	17,038	17,503	18,213
11.Total Health Expenditure (Rs.mn.)	27,476	34,419	44,850	58,038
Current Expenditure (Rs.mn.)	22,073	25,919	34,113	44,069
Capital Expenditure (Rs. mn.)	5,403	8,500	10,738	13,969
12.Total Health Expenditure as a % of GDP	1.51(b)	1.65(b)	1.83(b)	1.97(b)

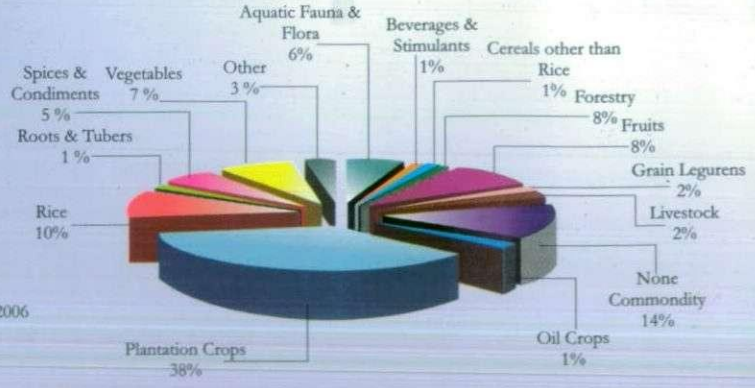
Source: Ministry of Healthcare and Nutrition; Ministry of Finance and Planning ; Central Bank of Sri Lanka
(a) Registered with the Department of Ayurvedic Commissioner
(b) Based on GDP estimates compiled by the Department of Census and Statistics

4.15 : Agriculture Research and Development - Some relevant indicators - 2006

a. Percentage budget by different disciplines



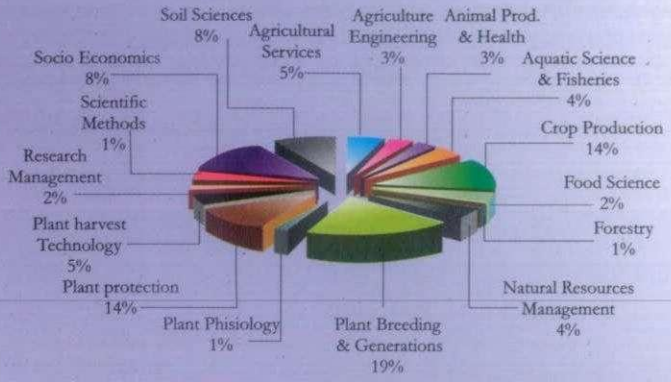
b. Percentage budget by different commodity groups



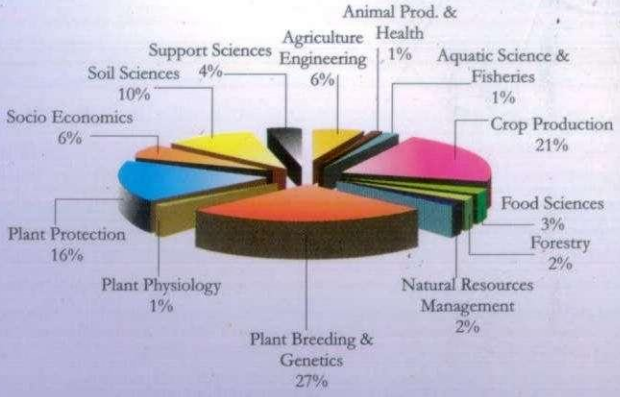
Source: INFORM, 2006 - Council of Agricultural Research Policy, Sri Lanka, 2006

4.15 : Agriculture Research and Development - Some relevant indicators - 2006

c. Percentage of research scientists by major disciplines in NARS 2006



d. Percentage of research projects by different disciplines conducted in NARS 2006



Source: INFORM, 2006 - Council of Agricultural Research Policy, Sri Lanka, 2006

4.16 : Ecosystem diversity and their extents in Sri Lanka

Aquatic ecosystem diversity	Present extent (ha)	Terrestrial ecosystem diversity	Present extent (ha)
Coastal Ecosystems		**Natural forest ecosystems**	
1. Coral reefs	not available	1. Tropical lowland wet evergreen forests or lowland rain forests	141,506
2. Sea grass beds	23,819	2. Tropical submontane forests	68,616
3. Salt marshes	33,573	3. Tropical montane forests	243,886
4. Mangroves	12,189	4. Tropical moist evergreen forests	1,090,981
5. Seashore/ beaches	not available	5. Tropical dry mixed evergreen forests	464,076
6. Mud flats	not available	Thorn scrub forests	not available
7. Lagoons and estuaries	158,017	**Natural grassland ecosystems**	
8. Sand dunes	7,606	1. Wet Patanas	not available
Inland Aquatic Systems		2. Dry Patanas*	65,000
1. Fresh water marshes	10,000**	3. Savannas*	not available
2. Rivers and streams Riverine Forests	22,435	4. Thalawas*	not available
3. Reservoirs*	170,000	5. Damanas*	10,000
		6. Villu	not available

* Man-influenced ecosystems ** Also include the villus

Source: Nimal Gunatilleke *et al*, Journal of National Science Foundation of Sri Lanka, Vol. 36, 2008 (special issue)

4.17 : Number of threatened species of selected groups of plants and animals

Plant and animal group	No. and (%) of nationally threatened species	
	Endemic	Non-endemic
Flora		252
Flowering plants	412 (61)	60
Ferns	30 (53)	
Vertebrates		
Mammals	14 (88)	27
Birds	16 (48)	30
Reptiles	37 (37)	19
Amphibians	51 (57)	1
Fishes	20 (45)	8
Invertebrates		
Land snails	32 (16)	1
Fresh water crabs	37 (73)	0
Dragonflies	20 (35)	0
Butterflies	13 (65)	53

Note: Percentage counted on the total number of endemics
Source: IUCN 2007

DEFINITIONS

The definitions and classifications used in the National R&D Survey 2006 and this Handbook are based on the recommendations of the *International Standardization of Statistics on Science and Technology* (UNESCO, 1978) and the *Frascati Manual* (OECD, 2002).

1. Research & Experimental Development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock knowledge, including knowledge of humanity, culture and society, and the use of this stock of knowledge to device new applications. The term R&D covers three activities: basic research, applied research and experimental development.

Basic research is the experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations phenomena and observed facts, without any particular application or use in view.

Applied research includes original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective.

Experimental development is the systematic work, drawing on existing knowledge gained from research and practical experience that is directed to producing new materials, products and devices; to installing new process, systems and services; or to improving substantially those already produced or installed.

2. Sectors

Government sector includes : all departments, offices and other bodies which furnish, but normally do not sell to the community , those common services .

Higher Education sector includes all universities, colleges of technology and other institutions providing tertiary education, whatever their sources of funds or legal status.

Private sector includes all firms, organizations and institutions whose primary activity is the market production of the goods or services (other than higher education) for sale to the general public at an economically significant price and to the private non profit institutions mainly serving them

3. R&D Expenditures

R&D Expenditures are all expenditures for R&D performed within a sector of the economy, including both

a. *Current cost* (labour cost, non capital purchases of materials, supplies of R&D equipments, water, fuel, gas electricity, library materials etc.)
b. *Capital expenditure* (reported in full for the period when they took place and should not register as element of depreciation)

4. Human Resources in Research and Development

Science and Technology Personnel (STP); It is defined according to the *Canberra Manual* (OECD, as persons fulfilling one of the following conditions:

- Successfully completed education at the tertiary level in an S&T field of study (seven broad S&T fields of study are Natural Science, Engineering and Technology, Medical Sciences, Agriculture Sciences, Social Sciences, Humanities and other fields).
- Not formally qualified as above but employed in an occupation where the above qualifications are normally required.
- Working in the above fields providing technical services or supporting services.

R&D Personnel are all persons employed directly on R&D, as well as those providing direct services such as R&D managers, administrators, and clerical staff excluding persons providing an indirect service such as canteen and security.

Researchers are professionals engaged in the conception or creation of new knowledge, product processes, methods and systems and also in the management of the projects concerned. Postgraduates students at the Ph.D. level engaged in R&D are also considered as researchers.

Technicians and equivalent staff are persons whose main tasks require technical knowledge and experience in one or more fields of engineering, physical and life sciences (technicians) or social sciences and humanities (equivalent staff). They participate in the R&D by performing scientific and technical tasks involving the application of concepts and operational methods normally under the supervision of researchers.

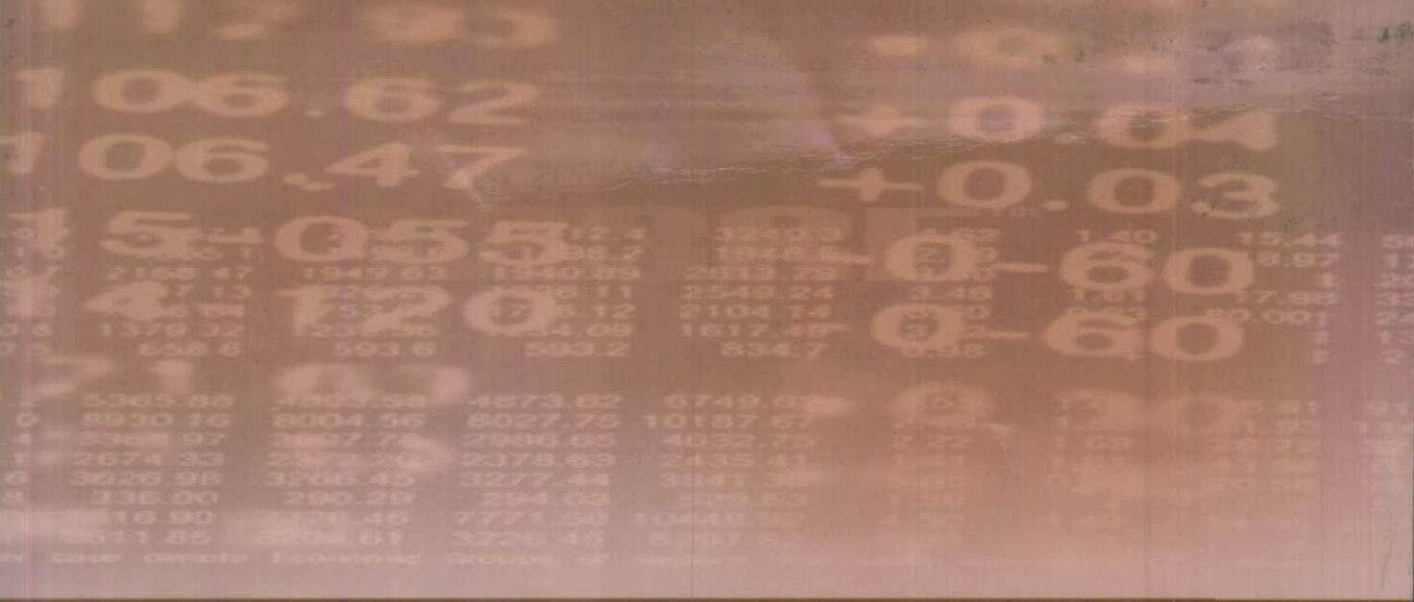
Other supporting staff includes skilled and unskilled craftsmen, secretarial and clerical staff participating in R&D projects or directly associated with (or providing services to researchers involved in) such projects.

Headcount data reflect the total number of persons employed in R&D, independently from their dedication. These data allow links to be made with other data series, such as education and employment data or the results of population censuses. They are also based for calculating indicators analyzing the characteristics of the R&D workforce, with respect to age, gender or national origin.

One **Full-time equivalent** is one person-year. (e.g. a person normally spends 30% of his/her time on R&D and the rest on other activities such as teaching , administration and counseling, the FTE is then counted as 0.3). Similarly, if full time R&D worker employed at an R&D unit for only for six months period the FTE is calculated as 0.5.

Abbreviations

FTE	Full Time Equivalent
GERD	Gross Expenditure on R&D
GDP	Gross Domestic Product
GNP	Gross National Product
HND	Higher National Diploma
IT	Information Technology
na	Not available
NA	Not Applicable
NGO	Non Government Organization
NSF	National Science Foundation
R&D	Research and Development
S&T	Science and Technology
SCI	Science Citation Index
SLAAS	Sri Lanka Association for the Advancement of Science
STP	Science and Technology Personnel
STPRD	Science & Technology Policy Research Division
UGC	University Grants Commission



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