SCIENCE AND TECHNOLOGY
STATUS REPORT OF SRI LANKA - 2016

National Science and Technology Commission
Ministry of Science, Technology & Research

SCIENCE AND TECHNOLOGY STATUS REPORT OF SRI LANKA -2016

(Prepared based on data collected from 37 Public S&T Institutions)

National Science & Technology Commission

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FOREWORD

The National Science and Technology Commission (NASTEC), established by the Science and Technology Development Act No. 11 of 1994, functions under the purview of the Ministry of Science and Technology. One of the key functions of the Commission is to submit an annual review report to the government on the Science and Technology (S&T) activities. The present report provides information gathered in 2017, based on the performance of 37 national S&T institutions; effectiveness of public spending on S&T, use of S&T developments, services provided by national S&T institutions and development of human resources during the year 2016 were analyzed.

The data revealed that overall researcher: non-researcher ratio was 1:6. Further, the research staff with a research degree such as PhD or MPhil was only 21% of the total number of research staff. This survey has also revealed that the number of newly recruited research staff (n = 99) members was less than the number left the institutions in the reference year. It was reported that nearly 1,065 research work had been published by these institutions. Of them, 51% were in the mode of abstracts, which were presented in national and international research symposia. One hundred and fifty six (15%) research papers were published in reputed indexed journals (indexed in Science Citation Index/Science citation index expand). Thirteen national patents had been obtained in the year 2016. Nearly 617,000 members of the public were provided with many services including testing, calibration, training, consultancies etc.; and about LKR 1,158 Million had been generated by these services, which was 47% higher than the previous year.

It gives me great pleasure to express my sincere thanks to the Chairpersons / Director Generals / Directors of the institutions who responded to our survey to enable us to prepare this national S&T report. I am also grateful to, and appreciate the Director and staff of NASTEC for the valuable service rendered towards preparing this document.

Professor W. L Sumathipala,
Chairman, NASTEC
31st October 2018

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ACRONYMS

ACIMT	- Arthur C. Clarke Institute for Modern Technologies
AEA	- Atomic Energy Authority
BARMI	- Bandaranaike Memorial Ayurvedic Research Institute
CEA	- Central Environment Authority
CRI	- Coconut Research Institute
DEA	- Department of Export Agriculture
DM	- Department of Meteorology
FD	- Forest Department
FMRC	- Farm Mechanization Research Centre
FRDI	- Fruit Crop Research & Development Institute
GJRTI	- Gem & Jewelry Research & Training Institute
GSMB	- Geological surveys & Mines Bureau
HARTI	- Hector Kobbekaduwa Agrarian Research & Training Institute
HCRDI	- Horticultural Crop Research & Development Institute
IPHT	- Institute of Post-Harvest Technology
ITI	- Industrial Technology Institute
MRI	- Medical Research Institute
NARA	- National Aquatic Resources Research & Development Agency
NBRO	- National Building Research Organization
NERD	- National Engineering Research & Development Centre
NIFS	- National Institute of Fundamental Studies

NPQS - National Plant Quarantine Services

NRDF - National Research & Development Framework

NRMC - Natural Resources Management Centre

NSF - National Science Foundation

ORP - Office of Registrar of Pesticides

PGRC - Plant Genetic Resources Centre

PPC - Plant Protection Service

R&D - Research & Development

RRDI - Rice Research & Development Institute

S&T - Science & Technology

SCPPS - Seed Certification & Plant Protection Service

SCS - Seed Certification Service

SLAB - Sri Lanka Accreditation Board for Conformity Assessment

SLCARP - Sri Lanka Council for Agricultural Research Policy

SLINTEC - Sri Lanka Institute of Nano Technology

SLSI - Sri Lanka Standard Institute

SRI - Sugarcane Research Institute

TRI - Tea Research Institute

VRI - Veterinary Research Institute

EXECUTIVE SUMMARY

Science & Technology Status Report 2016 contains data collected from 37 state sector Science and Technology Institutions. The results are presented under four major areas; human resources, physical resources, finances and productivity.

These institutions are categorized into five sectors, Agriculture, Plantation, Engineering, Medical, and 'Other'. There are 13, 3, 4, 3 and 14 institutions under each category respectively. These S&T Institutions are distributed among 10 ministries out of which 14 are under the Ministry of Agriculture and eight are under the Ministry of Science, Technology and Research.

In the focused year, there were 7,591 staff members working in these institutions. Out of them 1,138 (15%) were researchers (528 males and 610 females), 2,956 (38.9%) were scientific supportive (technical) staff and 3,498 were admin & account staff. The highest number of researchers were in the 'Other' sector (n = 559), followed by Agriculture (n = 255), Engineering (n = 120), Plantation (n = 112), and Medical (n = 92) respectively. The average number of research staff per institution was 31 (Range from 3 to 133). There were 11 institutions with less than 10 scientists. Around 42% of the researchers were competent in the fields of natural-applied sciences followed by agriculture (33%), engineering (14%), medicine (5.2%) and veterinary sciences (2.5%) respectively. Researchers with PhD, MPhil and MSc degrees were 181, 68, and 457 respectively. Total number of degrees supported by S&T institutions were 47 (PhD = 16, MPhil = 5, MSc = 21, BSc = 2, Postgraduate Diploma = 3).

Age group 41-50 years had highest number of research staff (n = 401) followed by 31-40 years (n = 381), >51 years (n = 249) and ≤30 years (n = 107) respectively. In this year, there were 99 newly recruited scientific staff and 123 employees left S&T institutions. Total 2,619 staff members participated in 544 workshops, seminars, conferences and training programs (258 local, 286 international programs).

*'Other'- Sectors in the areas of geology, technology, industries, nanotechnology, natural resources, meteorology, environment, aquatic resources, standardization & accreditation

In 2016, only 33 institutions of the surveyed group received funds for their research-based activities. The total amount received for research-based activities was approximately LKR 2,455.02 Million. Total expenditure was LKR 2,104.55 Million (85.6% of allocated budget). The Treasury was the main funding source for research-based activities. The 'Other' sector received the highest amount of funds for research-based activities (LKR 937.9 Million). During this period, total received for infrastructure development was LKR 1,571.8 Million.

Generation from client-based services was LKR 1,158.43 Million. Testing and calibration services generated highest revenue (41.7%), followed by consultation services (22.8%). Nearly 617,000 clients were served through these services. Three S&T institutions, namely SLSI, NBRO, and ITI contributed for 88% of the total revenue. In 2016, S&T institutions in five sectors developed 39 new products, 26 new processes and 35 technologies. Registered number of patents by three institutions was 13 (NERD: n = 5, SLINTEC: n = 4 and ITI: n = 4), one was sold and seven were implemented.

Total of 50 products and 30 processes were commercialized (27 by Engineering and 15 by Agriculture). In the year, 29 technologies were transferred and 48 recommendations were adopted. Highest number of technologies were transferred from Plantation sector (n = 14) while the highest number of recommendations were adopted from Engineering sector (n = 24).

Total number of publications by S&T institutions was 1,065. Main mode of publication was abstracts (n = 541, 51%). Sum of 156 (15%) research papers were published in indexed journals (Science Citation Index (SCI) /SCI-Expanded).

BACKGROUND

The National Science & Technology Commission (NASTEC) was established with the provision of Science & Technology Development Act No. 11 in 1994 and came into operations in August 1998. NASTEC was designated to be the apex policy formulating and advisory body on Science & Technology (S&T) matters to the government of Sri Lanka. Reviewing public S&T institutions and submitting a report to the government every year is a mandate of NASTEC.

There is no denying to the fact that S&T institutions are critical inputs for economic development and poverty alleviation. Evaluation of public S&T institution funded by the General Treasury has become a main concern of the government for many reasons. Prominently, there is a growing demand for evidence-based policies and for evaluation of the outputs of public investments. The government needs to determine the total amount to invest on S&T research, developments and innovations. Knowing the return of investment is also important. Therefore, evaluation of public funded S&T institutions helps to monitor the economic gain of investment in science, technology and innovation fields and to assess their social impacts. Such evaluations will also increase the accountability and effectiveness of S&T institutions. Hence, this evaluation assists prioritization of government decisions in resource allocation and design of development plans.

NASTEC provided a self-administered questionnaire to 39 public sector S&T institutions and requested them to fill up information based on 2016 facts and statistics. This status report consists of data received from 37 public S&T institutions under Human Resources, Physical Resources, Research Planning, Research Funding and Research Output. Field Crops Research & Development Institute and Rubber Research Institute did not submit their questionnaire. NASTEC collected this data through a liaison officer appointed for this particular purpose by each institution. Data collection period was 1st of August 2017 to 31st of November 2017. This report is an overview of the public sector contribution to the S&T institutes of Sri Lanka in the year 2016. The findings of this survey would be useful for future planning and investing in S&T in Sri Lanka.

1. General Information

The fundamental importance of S&T in both socio-economic and cultural development is now recognized and accepted without a doubt all over the world. Measuring the science, technology and innovation are fundamental for the formulation of national strategies for R&D. It is a responsibility of all stakeholders, in particular, the scientists and technologists to develop and maintain systems that would ensure sustainable development and high-quality life of our future generations.

For the purpose of analysis, these S&T institutions were categorized into five sectors based on the area of activities (Table 1.1). The institutions which could not be directly included under the four major sectors were categorized under the fifth 'Other' sector.

The institutions categorized under the 'Other' sector carry out activities and services in the areas of geology, technology, industries, nanotechnology, natural resources, meteorology, natural science, environment, aquatic resources, standardization & accreditation. The number of institutions under each sector is as per the Table 1.1.

Table 1.1: Sector- wise distributions of S&T Institutions

Sector	**Number of Institute**	**%**
Agriculture	13	35
Plantation	3	8
Engineering	4	11
Medical	3	8
Other	14	38
Total	**37**	**100**

Of the 37 S&T institutions, the highest number of responses was from 'Other' sector (n=14) followed by Agriculture (n = 13).

Table 1.2 shows the categorization of S&T institutions under each sector.

Table 1.2: Sector-wise categorization of S&T Institutions in Sri Lanka

Agriculture	Plantation	Engineering	Medical	Other
Fruit Crop Research & Development Institute (FRDI)	Coconut Research Institute (CRI)	Arthur C. Clarke Institute for Modern Technologies (ACIMT)	Medical Research Institute (MRI)	Atomic Energy Authority (AEA)
Hector Kobbekaduwa Agrarian Research & Training Institute (HARTI)	Sugarcane Research Institute (SRI	Farm Mechanization Research Centre (FMRC)	Veterinary Research Institute (VRI)	Gem & Jewelry Research & Training Institute (GJRTI)
Horticultural Crop Research & Development Institute (HCRDI)	Tea Research Institute (TRI)	National Building Research Organization (NBRO)	Bandaranaike Memorial Ayurvedic Research Institute (BARMI)	Industrial Technology Institute (ITI)
Institute of Post-Harvest Technology (IPHT)		National Engineering Research & Development Centre (NERD)		National Institute of Fundamental Studies (NIFS)
Plant Genetic Resources Centre (PGRC)				National Aquatic Resources Research & Development Agency (NARA)
Rice Research & Development Institute (RRDI)				National Science Foundation (NSF)
Sri Lanka Council for Agricultural Research Policy (SLCARP)				Natural Resources Management Centre (NRMC)
Seed Certification Service (SCS)				Sri Lanka Accreditation Board for Conformity Assessment (SLAB)
Office of Registrar of Pesticides (ORP)				Sri Lanka Institute of Nanotechnology (SLINTEC)
Seed Certification & Plant Protection Service (SCPPS)				Central Environment Authority (CEA)
National Plant Quarantine Services (NPQS)				Department of Meteorology (DM)
Plant Protection Service (PPC)				Forest Department (FD)
Department of Export Agriculture (DEA)				Geological surveys & Mines Bureau (GSMB)

The S&T institutions included in this study function under 10 different Ministries. The majority (n=14) of them are attached to the Ministry of Agriculture (n =14, 38%) and only eight (n = 8, 22%) are under the Ministry of Science, Technology & Research (Table 1.3).

Table 1.3: The Ministries to which the S&T Institutions used in this survey are attached

MINISTRY									
Agriculture	**Science Technology & Research**	**Health, Nutrition & Indigenous Medicine**	**Fisheries and Aquatic Resources & Development**	**Primary Industries**	**Mahaweli Development & Environment**	**Power & Renewable Energy**	**Plantation Industries**	**Disaster Management**	**Rural Economic Affaires**
CARP	SLAB	BARMI	NARA	DEA	CEA	AEA	SRI	DM	VRI
FRMC	ITI	MRI			FD		TRI	NBRO	
FRDI	NERD				GJRTI		CRI		
HARTI	NIFS				GSMB				
HORDI	NSF								
IPHT	SLINTEC								
NPQC	ACIMT								
NRMC	SLSI								
PGRC									
PPC									
ORP									
RRDI									
SCS									
SCPP									

Statutory functions of S&T institutions are as follows.

1. Research & Development (R&D)
2. Research Funding
3. S&T services
4. S&T policy formulation
5. Technology transfer
6. Science popularization

Table 1.4 shows the number of S & T institutions carrying out each of above functions

Table 1.4: Major Statutory Functions conducted by S & T institutions

Statutory Function	Number of Institutions	%
R&D	33	89.2
Research Funding	3	8.1
S&T Services	25	67.6
S&T Policy Formulation	7	18.9
Technology Transfer	22	59.5
Science Popularization	13	35.1

Research and Development (R&D) is one of the key functions of S&T institutions and it refers to innovative activities undertaken by corporations or governments in developing either new services/ products or improving existing services/ products. The R & D either may pave the path for direct development of a new product or facilitates future product development. The survey revealed that R&D is one of the statutory functions of 33 (89.2%) institutions, but not so in four institutions namely SLAB, DM and SCPPS, PPS & SLSI.

Research funding is a term generally covers any funding for scientific research, in the areas of science, technology and social sciences. The study found that research funding is one of the core statutory functions of three institutions, CARP, NSF and MRI.

In this survey, any service under analytical testing, quality assurance, laboratory accreditation, instrument calibration and any other specialized service goes under Science and Technology services (S&T services). Out of all, 25 S&T institutions (68%) provided such services.

Science and technology policy (S&T policy) is one of the public policies that promotes appropriate funding to advance scientific and technological research and education. This policy studies the impact on citizenry by science and technology and prescribes regulation if necessary. It covers a wide range of knowledge producing activities, including research. The findings of the survey reveals that seven institutions (19%) involved in S&T policy formulation activities.

Technology transfer is the process by which basic research and fundamental discoveries are developed in to practical and commercially relevant applications or products. According to the survey, 22 institutions (60%) involved in those specific activities.

The term "science popularization" refers to a set of activities, disciplines and approaches that communicate science to a wider audience. Nearly one-third of institutions (n=13) involved in science popularization activities.

Some institutes involved in functions such as consultation, advisory, development of patient care etcetera. Sector - wise distribution of statutory functions is given in Figure 1.1.

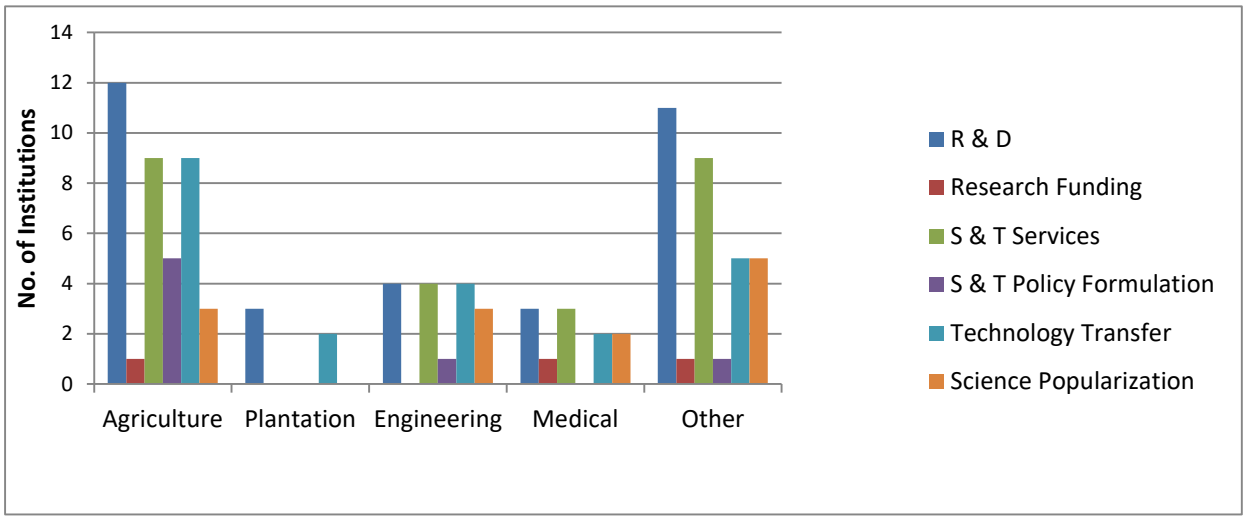


Figure 1.1: Sector-wise distribution of statutory functions of S&T institutions

Institutions under Agriculture & 'Other' sectors covered all six statutory functions identified in this study. Institutions under Plantation sector covered only R&D and Technology Transfer activities. Further, the survey revealed that Research funding and Policy formulation were not statutory functions of Engineering and Medical sectors respectively.

2 Human Resources

Human resource is used as one of the indicators of the development of knowledge-based economy. The global demand for Human Resources in S&T (HRST) is increasing as countries worldwide move towards knowledge-based economies. For this purpose, countries need to build a critical mass of well-trained scientists, engineers, professionals, technicians, graduates and domain experts with broadened scientific training and skills.

Comprehensive analysis of HRST data helps to understand the challenges in S&T education, training, institutional restructuring, providing incentives and rewards, mobility of scientists, new career paths available for science students, the role of industry, future career opportunities and policy intervention.

When analyzing HRST; number of scientific and non-scientific staff, areas of expertise, highest level of education, age and gender were the main attributes.

2.1 Categories of staff employed in S&T institutions

Scientific, Administrative, Accounting and Other were the staff categories of human resources employed in S&T institutions. Scientific staff was further grouped into Research Staff, Research Support Staff, and Librarians / Research Information Officers.

Definitions:

Research Staff: A group of personnel who holds the relevant academic qualifications and expected to generate new knowledge / methods / techniques by research / design / development and or responsible for leading / managing the projects

Research Supportive Staff: The staff with appropriate vocational / technical qualifications who assists their superior on S&T activities through assigned tasks.

Librarians / Research Information Officers: Librarians are an integral part of R&D activities done by the institutions, who serve the researchers through various means of scientific informative activities. With the advancement of technology, their role has been re-defined as “informative scientist”.

Administrative Staff: All the staff members who handle the administrative tasks and not directly involved with any science or research-related activities.

Accounting Staff: Directly involved in the financial activities.

Other Supporting staff: Involved in supporting / assisting cross-functional nonrelated research activities, i.e. secretaries, craftsmen, gardeners, animal housekeeper, clerks, computer application assistants, laborers and other minor staff.

The total number of employees attached to S&T institutions (n=37) in this survey was 7,591 (Median= 145_ [IQR: 63-222]). SLAB reported to have the lowest number of staff members (n=18) while DEA reported the highest figure of 1,055 staff.

Out of the total, 4,093 were scientific staff (53.9%) and 3,498 were non-scientific staff. Figure 2.1 shows sector - wise comparative distribution of this.

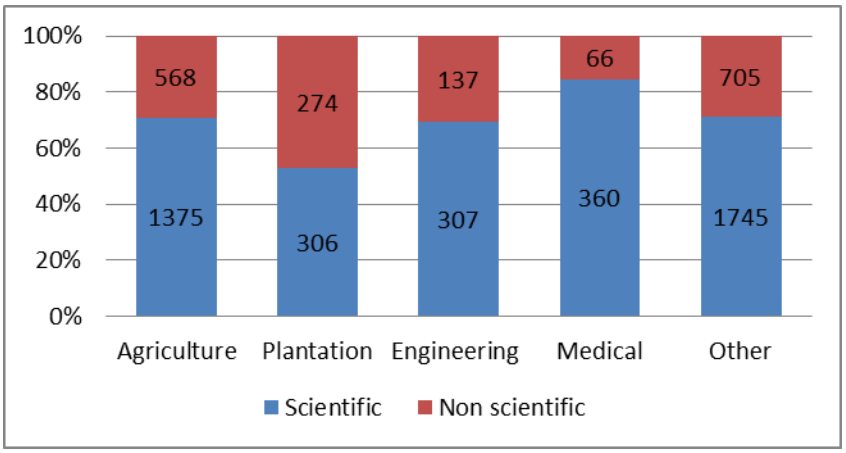


Figure 2.1: Composition of scientific and nonscientific staff by sector

(Note: The number of staff is shown in the bar)

Table 2.1: Staff Strength – Distribution of staff employed in S&T institutions

Sector	Scientific staff			Accounting Staff		Administrative Staff		Other staff	Total
	Research Staff	Research Support Staff	Librarian / Information Officers	Accountants	Acc. Support Staff	Executives	Exclu.. Support Staff		
Agriculture	255	1,111	9	6	67	43	452	1,186	3,129
Plantation	112	193	1	6	47	22	199	141	721
Engineering	120	184	3	7	37	8	85	108	552
Medical	92	267	1	0	24	9	33	127	553
"Other"	559	1,167	20	22	122	65	496	186	2,637
Subtotal	**1,138**	**2,922**	**34**	**41**	**297**	**147**	**1,265**	**1,748**	**7,592**
Total	**4,094**			**338**		**1,412**			

The distribution of staff employed in each sector is given in Table 2.1. Agriculture sector had the highest number (n = 3, 129, 41%) while Engineering had the lowest (n = 552, 7.2%).

Out of the entire group, 4,094 members (54%) were scientific staff with a composition of 71% research support staff and 28% research staff.

The highest number of research staff (n = 559) was employed in 'Other' sector, followed by Agriculture, Engineering, Plantation and Medical respectively. The records showed that the ratio between research: research support staff was 2:5. Agriculture sector showed the highest (1:4) while Engineering the lowest (1:1).

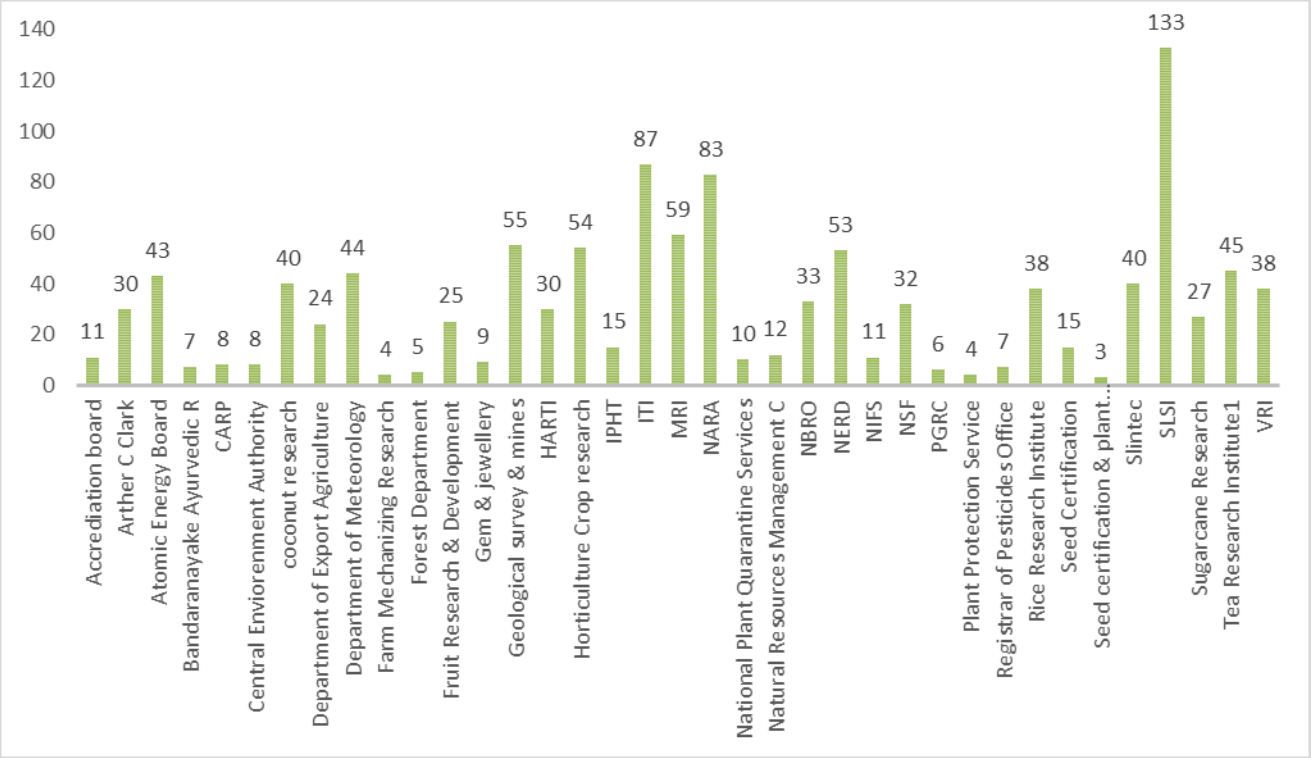


Figure 2.2: Distribution of research staff among S&T institutions

The distribution of research staff among S&T institutions is as per the Figure 2.2. Seed Certification & Plant Protection Services reported the lowest number of research staff (n = 3) and SLSI the highest (n = 133).

The availability of the adequate number of research staff has a direct impact on the functions of S&T institutions. In this survey, sector - wise comparison of research staff was not done due to high variance of number of institutions per sector.

The majority of S&T institutions (n = 11, 30%) had less than 10 research staff (Figure 2.3).

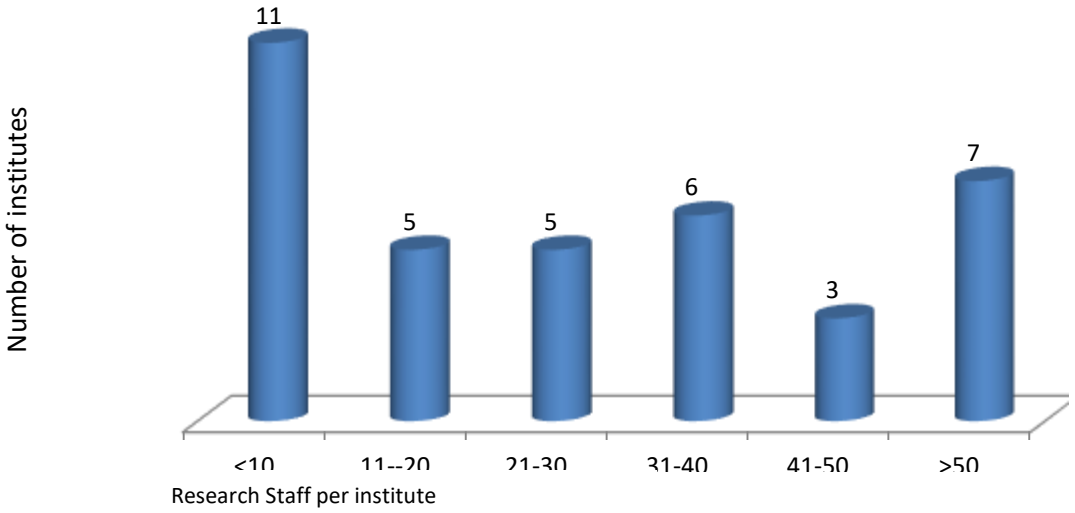


Figure: 2.3: Composition of research staff per institute

There were seven institutes (19%) with more than 50 research staff. Table 2.2 provides the list of S&T institutions according to the number of research staff present. Table 2.2: S&T Institutions according to the number of research staff present

Count of Research Staff					
<10	**11--20**	**21-30**	**31-40**	**41-50**	**>51**
BARMI	SLAB	ACIMT	CRI	AEA	GSMB
CARP	IPHT	DEA	NBRO	DM	HODI
CEA	NRMC	FRDI	NSF	TRI	ITI
FMRC	NIFS	HARTI	RRDI		MRI
FD	SCS	SRI	SLINTEC		NARA
GJRTI		VRI			NERD
NPQS					SLSI
PGRC					
PPC					
RPO					
SCPPS					

2.2 Gender Composition of Research Staff

All five sectors considered, the percentage of male research staff (46%) was lower than the female staff (54%) (Figure 2.4).

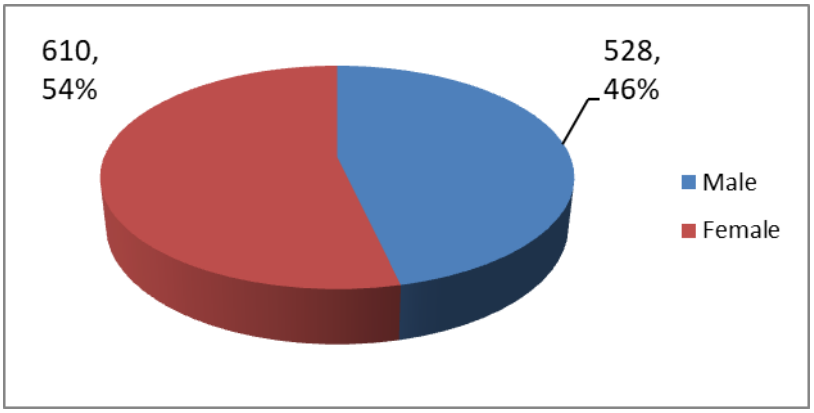
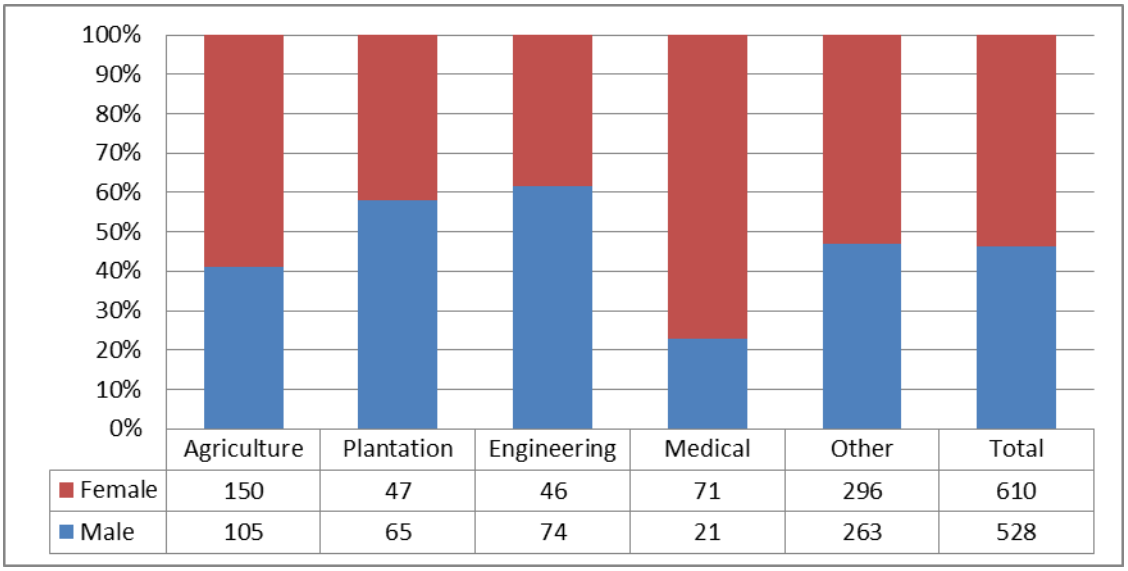


Figure 2.4: Gender distribution of research staff

2.3 Sector wise gender distribution of research staff

Number of female research staff was leading in almost all the sectors except in Engineering sector where the male percentage was higher than the female (n = 74, 62%). Medical Sector reported the highest percentage of female research staff (n = 71, 77%) (Figure 2.5).



	Agriculture	Plantation	Engineering	Medical	Other	Total
Female	150	47	46	71	296	610
Male	105	65	74	21	263	528

Figure 2.5 Sector – wise gender distribution of research staff

2.4 Area of expertise of research staff

In current survey, the areas of expertise of research staff were categorized under Natural / Applied Sciences, Engineering, Medicine, Agriculture, Veterinary Sciences and 'Other'. The highest number of research staff was working in natural / applied sciences (n = 472, 41.5%) and the lowest was in veterinary science (n = 20, 2.5%). (Table 2.3)

Table 2.3: Distribution of research staff in S&T institutions based on areas of expertise (academic disciplines) and gender

Field of Expertise	Male (n, %)	Female (n, %)	Total (n, %)
Natural / Applied Sciences	213 (45)	259 (55)	**472 (42)**
Engineering	106 (68)	49 (32)	**155 (14)**
Medicine	11 (19)	48 (81)	**59 (5)**
Agriculture	166 (44)	212 (56)	**378 (33)**
Veterinary Science	9 (31)	20 (69)	**29 (3)**
Other	23 (51)	22 (49)	**45 (4)**
Total	**528 (46)**	**610 (54)**	**1138 (100)**

2.5 Age distribution of research staff

The age distribution of research staff in S&T institutions is a useful indicator as it accentuates the experience of R&D workforce, which has a direct positive link to employee productivity and performance. This distribution is given in Figure 2.6.

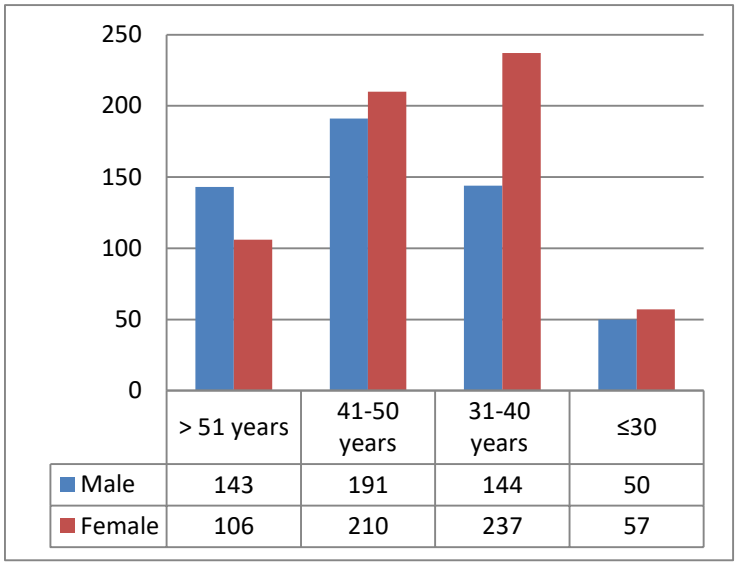


Figure 2.6 Age distribution of research staff

The highest number of researchers (n = 401, 35.2%) was in the age group of 41-50 years and the lowest n=107 (9.4%) was in the age group of ≤30 years. The data reaffirmed the existence of gender inequality across the defined sectors.

2.6 Highest educational qualification of the research staff

Level of education attainment is one of the key indicators, which can be used to identify the quality and the strength of researchers' work. In this study, educational qualifications considered were PhD, M.Phil. MSc, BSc and Postgraduate Diploma. The distribution of highest educational qualification of research staff is given in Figure 2.7.

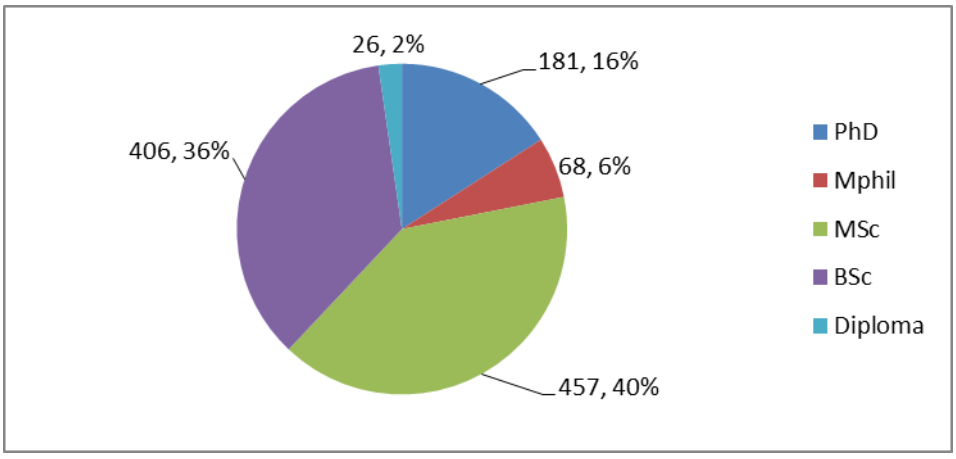
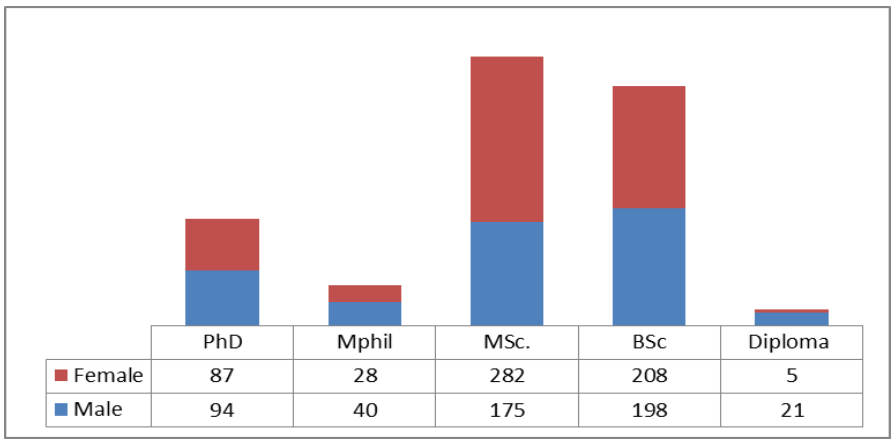


Figure: 2.7: Distribution of highest educational qualification of research staff

Out of the total research staff, there was 36% with a basic degree in Sciences (BSc), 46% with a Masters [MPhils (6%) & MScs (40%)] and 16% with a Doctorate. The data further revealed that 60% of the researchers had postgraduate qualifications.

The number of male research staff with a research based higher degree (i.e. PhD, MPhil) was higher than that of female (Figure 2.8).



	PhD	Mphil	MSc.	BSc	Diploma
Female	87	28	282	208	5
Male	94	40	175	198	21

Figure 2.8: Distribution of gender-wise highest educational qualification of research staff

2.7 Human Resource Development (HRD)

2.7.1 Workshops, seminars & conferences (local & international)

A Continuous program in Professional Development (CPD) is a training beyond formal undergraduate and postgraduate education, which enables individual researchers to maintain and improve standards of their practices through development of knowledge, skills, attitudes, and behavior. CPD also supports specific changes in practice. All the 37 surveyed institutions provided the HRD-CPD data except MRI.

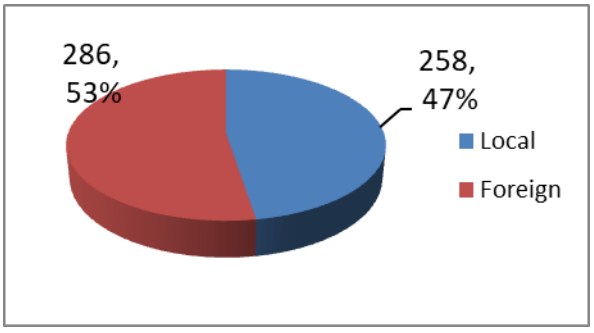
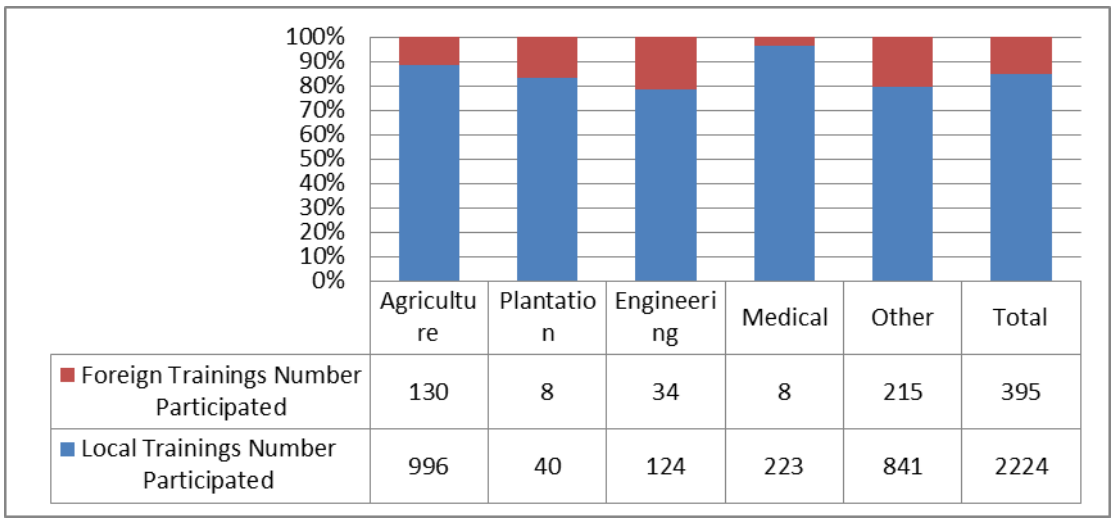


Figure 2.9: Composition of staff training programmes (Local & Foreign)

In 2016, a total number of 2,619 staff members (35.5%) participated in 544 training programs, which comprised of 258 local and 286 foreign trainings (Figure 2.9).

The sector - wise distribution of staff training is shown in Figure 2.10. Of the total participation, 2,224 (85%) went through the local training and rest 395 (15%) went through the foreign training.



	Agriculture	Plantation	Engineering	Medical	Other	Total
Foreign Trainings Number Participated	130	8	34	8	215	395
Local Trainings Number Participated	996	40	124	223	841	2224

Figure 2.10: Sector wise distribution of staff trainings

Agriculture sector showed the highest number of participation (n = 1,126, 50.6%) while the least number of participations was reported by Plantation sector (n = 48, 2.1%) (Figure 2.10).

The training opportunities received by different staff categories are shown in Figure 2.11.

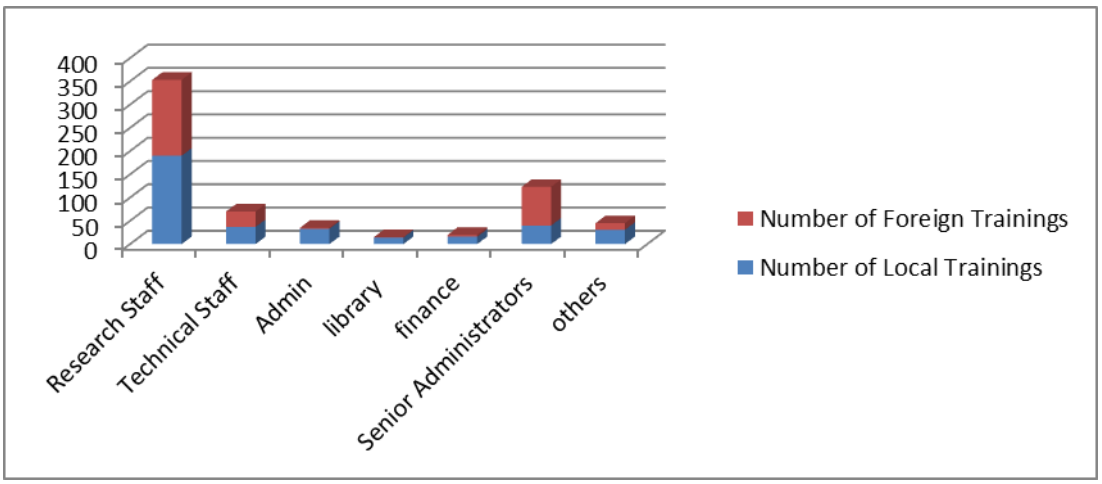


Figure 2.11: Training opportunities received by different staff categories

The figure above shows that the highest number of training opportunities (n = 353, 53%) was given to research staff in 2016.

2.7.2 Staff turnover of scientific staff

Scientific staff is one of the primary key assets of S&T institutions as they directly engage with the core business functions of the institutions. Employee turnover refers to the number of workers or the percentage of workers who leave an organization and the replacement of new employees. The assignments carried out by the research staff have a direct impact on the institutional success. Therefore, ascertaining the staff turnover in detail is important.

2.7.3 Recruitment of scientific staff

Table: 2.4 Sector wise recruitment of scientific staff

Scientific Staff Category	Sector					Total
	Agriculture	Plantation	Engineering	Medical	Other	
Research Staff	1	3	22	0	61	**87**
Research Support Staff	0	0	0	0	12	**12**
Total	**1**	**3**	**22**	**0**	**73**	**99**

In the year 2016, the total recruitment of scientific staff was 99. The 'Other' sector made the highest recruitment (n = 73) followed by Engineering sector (n = 22).

2.7.4 Leaving of scientific staff

Table 2.5 Breakdown of sector wise scientific staff who left the institutions

Scientific Staff Category	Sector					
	Agriculture	Plantation	Engineering	Medical	Other	Total
Research Staff	10	1	12	8	41	72
Research Support Staff	2	0	0	0	49	51
Total	12	1	12	8	90	123

In 2016, a total of 123 members of scientific staff had left S&T intuitions while 99 new members were recruited to fill up the vacancies (Table 2.4 & Table 2.5). The data shows that the highest number of staff had left from 'Other' sector.

Main reasons for leaving the institutions were linked to expectations in career growth and migration.

2.7.5 Funding for higher studies

The number of scientific staff who received offers for higher study opportunities by their institutions through foster employee development is given in Table 2.6.

Table 2.6: Number of scientific staff who was supported for higher sturdies by S&T institutions

Degree funded by the institution	Agriculture	Plantation	Engineering	Medical	'Other'	Total
PhD	4	4	0	0	8	16
MPhil	3	0	0	0	2	5
MSc	0	0	4	0	17	21
BSc	0	0	0	0	2	2
Postgraduate Diploma	0	0	2	0	1	3
TOTAL	**7**	**4**	**6**	**0**	**30**	**47**

A total of 47 scientific staff was funded by their respective institutions to pursue higher studies. There were five undergraduate degree sponsorships, 21 for MSc, 5 for MPhil and 16 for PhD. The 'Other' sector has funded the highest number of postgraduate degrees. However, Medical sector had not provided funding for any higher study program (Table2.6).

2.7.6 Incentives for scientific staff

In any working environment, providing incentives is considered as an excellent way of valuing employees to entice talented individuals and to retain qualified staff. According to this study, it is clear that there is no uniformity in the benefits given to the scientific staff. Table 2.7 shows the incentives given in 2016 to scientific staff in S&T institutions. Out of 37 S&T institutes, only 10 institutions (28%) had provided a research allowance and only nine institutions had provided a medical allowance to the scientific staff.

Table 2.7: Perks given to the scientific staff of S&T institutions

Perk	No. of institutions
Research allowance	10
Medical allowance	9
Performance base incentives	3
Transport allowance	4
Communication allowance	5
Professional allowance	2

3 Physical Resources

3.1 Infrastructure Facilities

The term 'infrastructure' refers to facilities, resources and related services used by scientific community to conduct research & development activities in their respective fields. This covers scientific equipment or set of instruments, knowledge-based resources such as collections / archives / structured scientific information, information and communication technology-based infrastructure such as grid / computing / software / communication, or any other entity of unique nature essential to conduct R & D.

Other than the general infrastructure facilities, there were some unique facilities, which were limited to few institutions with respect to their nature of specific functions. Such as animal houses, museums, specialized and equipped training centers, information centers and residential training facilities.

Table 3.1 provides the common infrastructure facilities available in S&T institutions. Every sector was equipped with in-house laboratories totaling to 274. The 'Other' sector reported to be having the highest number of laboratories (n =135) while Plantation sector with the lowest (n = 9).

Table 3.1: Basic infrastructure facilities found in S & T institutions

Sector	Laboratories	Workshops/Plants	Auditoriums	Libraries
Agriculture	71	4	26	11
Plantation	9	2	2	3
Engineering	15	6	6	4
Medical	44	0	7	2
Other	135	6	27	14
Total	**274**	**18**	**68**	**34**

3.2 IT Related Facilities and Databases

All the participated institutions hold a dedicated corporate web site. Marking a step ahead, all the institutions attached to the Department of Agriculture were connected through Intranet (a central main website) which eases the information sharing among the institutes of that sector.

Out of the 37 S&T institutions, 21 (57%) had a research database. Agriculture sector reported the highest number (n = 9), while the lowest was reported by Medical sector (n = 1) (Table 3.2).

Table 3.2: Breakdown of S&T institutions with research database

Sector (N))	Institutions with a research database (n)	% of institutions with a research database -(n/N)
Agriculture (13)	9	69
Plantation (3)	2	67
Engineering (4)	2	50
Medicine (3)	1	33
Other (14)	7	50
Total (37)	**21**	**57**

3.3 ICT facilities

Distribution of basic ICT facilities among the sector – wise staff categories is given in Table 3.3. The total number of personal computers used by scientific staff and non-scientific staff was 1,863 and 1,320 respectively.

Table 3.3: ICT facilities available in S & T institutions in 2016

Sector	Computers for Scientific Staff	Computers for nonscientific staff	Printers for scientific Staff	Printers for nonscientific staff	Scanners for scientific staff	Scanners for nonscientific staff
Agriculture	327	179	156	90	16	13
Plantation	87	88	31	34	6	6
Engineering	409	208	111	42	9	9
Medical	78	38	36	26	2	2
Other	962	807	413	523	37	38
Total	**1,863**	**1,320**	**747**	**715**	**70**	**68**

The proportion of personal computer facilities for scientific staff was higher in Engineering sector followed by 'Other' sector (Table 3.4).

Table 3.4 Sector – wise availability of computers among the staff

Sector	No. Personal computers/ no. of scientific staff	No personal computers/no. of non-scientific staff	Proportions Computers vs Staff	
			Scientific staff	Non-scientific staff
Agriculture	327/1375	179/568	0.23	0.31
Plantation	87/306	88/274	0.28	0.32
Engineering	409/307	208/137	1.33	1.51
Medical	78/360	38/66	0.21	0.57
Other	962/1745	807/705	0.55	1.14
Total	**1863/4093**	**1320/1750**	**0.45**	**0.75**

4. Research Planning

Under this section, the information on source document to formulate the respective institutional annual action plan was sought from the 37 S&T institutions. While preparing their annual action plan, 13 institutions (36%) referred to the S&T policy as a source document, another 13 (36%) referred to the National Research & Development Framework (NRDF) as one of their source documents and nine (25%) other institutions referred to both documents. In addition, there were some other documents cited as source documents by few institutions namely Agriculture Research Policy, Research priorities identified by the CARP, NBRO cooperation plan, national priorities, Act number 47 of 1987, reviews of the annual research activities and priorities requested by the respective ministries.

5. Research Funding

5.1 The funding source for research activities

Seven Institutions namely SLAB, CEA, SCS, SCPPS, RPO, SLSI and GSMB did not provide this financial detail, as R&D is not a mandate functional activity in those institutions. Most of them carry out their research using secondary data received by conducting their routine activities.
In the year 2016, a sum of LKR 2,469.5 Million was allocated for R&D based activities and out of it, a total of LKR 2,104.5 Million (85.2%) was spent.

The details of the source of funding for research activities are given in Table 5.1.
The Treasury was the major direct source of funding for research activities conducted by S&T institutions. Other than the Treasury, there were some contributions from foreign funds, NSF and NRC grants. For reporting purpose, sources of funding which were not defined through the above given sources is categorized as 'Other'.

Table 5.1: Funds received for research activities by different funding sources

Funding Source	Amount Received / LKR Million	Amount Spent / LKR Million	% Utilization
Treasury	2,110.52	1,855.74	87.93
Foreign	96.73	77.91	80.54
NSF	89.94	12.49	13.88
NRC	3.00	0.30	10.00
Other	169.29	158.11	93.40
Total	2,469.5	2,104.5	85.2

Table 5.2 provides the sector - wise distribution of funds received for research work. The 'Other' sector received the highest amount of funds for research and the lowest was received by Engineering sector. The highest percentage of funds was utilized by Engineering sector, while the lowest utilization was in Agriculture sector.

Table 5.2: Sector – wise utilization of funds received for research work

Name of the Sector (number of institutions=n)	Funds Received/ LKR Million	Funds Spent /LKR Million	% Utilization
Agriculture (11)	629	424.1	67.4
Plantation (3)	607.2	575.4	94.8
Engineering (4)	60.5.8	58.7	97.0
Medical (3)	232.2	218.5	94.1
"Other" (9)	940.6	827.9	87.2
Total (30)	**2,469.5**	**2,104.6**	**85.22**

As these S&T institutions are distributed among 10 ministries, finding out the contribution of each ministry for research work is also important. Table 5.3 illustrates funds allocated for research-based activities by different ministries.

Table 5.3: Allocation of funds for research work by relevant Ministries

Name of the Ministry (n)	Funds given for research LKR/Million
Agriculture (12)	709.22
Science, Technology & Research (6)	667.97
Health, Nutrition & Indigenous Medicine (2)	106.25
Fisheries and Aquatic Resources & Development (1)	180.00
Primary Industries (1)	25.40
Mahaweli Development & Environment (2)	20.28
Power & Renewable Energy (1)	5.97
Plantation Industries (3)	607.20
Disaster Management (1)	125.9
Rural Economic Affairs (1)	21.28
Total (n=33)	**2,469.5**

*Only the Institutes with R&D activities as a statutory function are included (n = 30)

Following issues were highlighted as reasons for non-optimized utilization of funds;

- Lack of research staff
- Lack of research equipment
- Issues associated with administration-procurement (i.e. delays in purchasing equipment and lab-chemicals)
- Delays in replacements
- Poor planning
- Delay in receiving tranche

5.2 Funds allocated to upgrade infrastructure and other facilities in the institutions

The General Treasury is the major funding source for upgrading S&T institutions. These institutions received a total of LKR 1,571.8 Million for upgrades (Table 5.4). Major portion of these funds was utilized to purchase new equipment (68%) followed by construction works (23%). Among the institutions, GSMB received the highest amount of funds (LKR 588 Million) to procure equipment followed by SLINTEC (LKR 213.4 Million).

Table 5.4 Funds utilization by S&T institutions for upgrading

Event	Amount LKR Million	Percentage
Renovation	30.6	2%
Construction	358.8	23%
Purchasing equipment	1,064.6	68%
Other upgrading	117.8	7%
Total	**1,571.8**	**100%**

6. Research Outputs

6.1 Research Projects

In 2016, a total amount of 435 research projects were carried out by 34 S&T institutions. SLAB, CEA & SLSI did not conduct any research project, as it was not a mandate function of them.

Of the 435 research projects, 112 (25%) were collaboratively done with other institutions. Out of them, 25 projects with foreign institutions, 30 with local universities and 57 with other local institutions. Figure 6.1gives graphical detail of research projects conducted by S & T institutions.

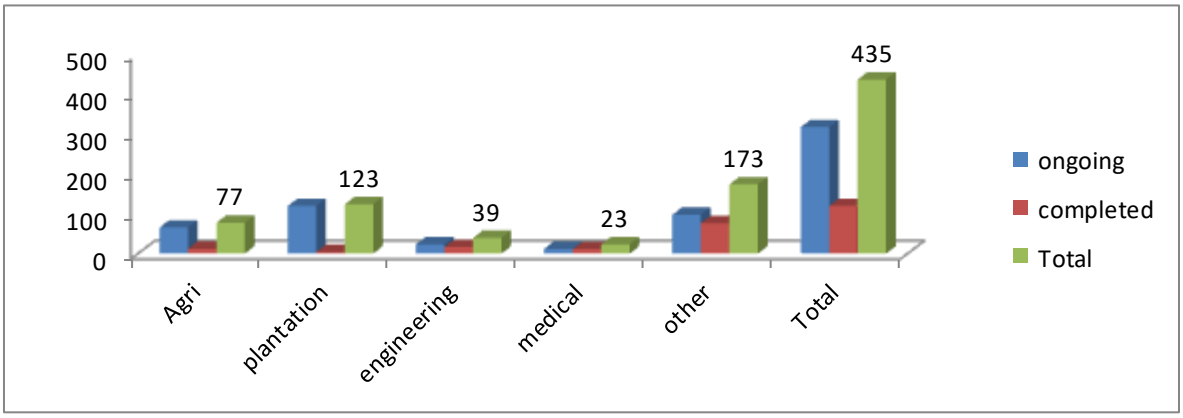


Figure 6.1: Research projects conducted by S&T institutions

The highest number of research projects was carried out by 'Other' sector. In Medical sector, only VRI could provide full data regarding the number of projects; BMARI and MRI failed to provide the requested data on this area.

Among all the institutions, the highest number of research projects was completed by TRI (n = 103, 24%) while 316 (73%) were ongoing.

6.2 New products / processes / technologies developed through research

In the focused year, 39 new products, 26 new processes and 35 new technologies were developed. These details are given in Table 6.1.

Table 6.1: S&T institutions which developed new products, processes and technologies

New products developed (n = 39)	New processes developed (n = 26)	New technologies developed (n=35)
ACIMT	ITI	CRI
AEA	NPQS	FMRC
FRDI	NBRO	FRDI
IPHT	NERD	IPHT
ITI	SLINTEC	ITI
NBRO		NBRO
RRDI		NERD
SLINTEC		RRDI
SRI		SLINTEC
		SRI
		VRI

6.3 Number of Publications

Table 6.2: Various scientific publications produced by S& T institutions in the year 2016

Sector	In SCI &/ SCI Expanded journals published	In other Refereed journals published	Abstracts of papers presented	Monographs	Books	Chapters in books	Other	Total
Agriculture	3	46	85	0	1	0	40	**175**
Plantation	8	22	69	1	0	5	23	**128**
Engineering	2	3	55	2	1	0	5	**68**
Medical	31	8	44	0	0	0	0	**83**
Other	102	70	288	8	38	22	83	**611**
Total	**146**	**149**	**541**	**11**	**40**	**27**	**151**	**1,065**

A sum of 1,065 publications produced by S&T institutions across the sectors within the stipulated period. Main form of publication was Abstracts (n=541, 50.8 %) (Table 6.2). A total number of

146 (13.7%) research papers were published in the journals, which are indexed in the Science Citation Index (SCI) and/or SCI Expanded. Based on collected data, 'Other' sector had a major contribution to the scientific publications, which represented the research disciplines in Natural / Applied / Basic Sciences. Medical sector showed the lowest contribution during the year.

6.4 Patents registered by S & T institutions

There were 13 patents registered in 2016. Only three institutes were involved in getting patents for their inventions: NERD = 5, SLINTEC = 4 and ITI = 4 (Table 6.3). One of the patents was sold out and seven were implemented.

Table 6.3: Patents received by scientists / institutions

Sector	Number of items patented	National patents	International patents	Patent implemented	Patent sold
Agriculture	0	0	0	0	0
Plantation	0	0	0	0	0
Engineering	5	5	0	5	0
Medical	0	0	0	0	0
Other	8	8	0	2	1
Total	**13**	**13**	**0**	**7**	**1**

6.5 The awards received by scientists

A total of 58 awards received by scientists during the said year (national awards = 47, international awards = 11) (Table 6.4). Scientists in 'Other' sector received the highest number of awards, which was followed by those in Plantation sector.

Table 6.4: Awards received by scientists

Sector	National awards	International awards	Total awards received
Agriculture	5	1	6
Plantation	10	2	12
Engineering	0	2	2
Medical	0	1	1
Other	32	5	37
Total	**47**	**11**	**58**

6.6 Products & processes commercialized by the institutions

This survey revealed that there were 30 processes and 50 products commercialized by S&T institutions during the reported period, and the highest number of processes (n = 13) was commercialized by Agriculture sector. The details are as per the Table 6.5 below.

Table 6.5: S&T institutions which commercialized processes

Sector	Institute	Number of processes commercialized
Agriculture	DEA	13
	FRDI	
	IPHT	
Plantation	SRI	3
Engineering	NERD	8
	NBRO	
Medical	None	0
Other	FD	6
	GJRTI	
	SLINTEC	
TOTAL		**30**

According to the gathered data, only 10 institutions contributed towards commercialization of products. The list of details is provided in Table 6.6. The highest number of products (n = 27) was commercialized by Engineering sector and second highest by Agriculture sector (n = 15).

Table 6.6: S&T institutions which commercialized products

Sector	Institute	Products commercialized
Agriculture	DEA	15
	FRDI	
	IPHT	
	RRDI	
Plantation	SRI	3
Engineering	ACIMT	27
	NERD	
	NBRO	
Medical	None	0
Other	FD	5
	SLINTEC	
TOTAL		**50**

6.7 Technologies transferred & recommendations adopted

Technology often needs to migrate from its place and culture of origin to other destinations. Technology transfer, which is also called Transfer Of Technology (TOT), is the process of transferring (disseminating) technology from places / groups of origin to a wider audience. It occurs along various axes: among the universities, from universities towards businesses, from large businesses to smaller ones, from governments to businesses, across border lines both formally and informally, and both openly and surreptitiously.

It occurs by concerted efforts to share skills, knowledge, technologies, methods of manufacturing, samples of manufacturing, and facilities among governments, universities and/or other institutions. Intention behind dissemination is to ensure that scientific and technological developments are accessible to a wider range of users who can further develop the technology into new products, processes, applications, materials, or services. The process of technology

alleviation takes place through transfer / valorization / commercialization, innovation, adoption / diffusion, and integration.

According to this study, there were 29 technologies transferred and 48 recommendations adopted in the year 2016 (Figure 6.2). The highest number of technologies was transferred by Plantation sector (n = 14), while the highest number of recommendations was adopted by Engineering sector (n = 24).

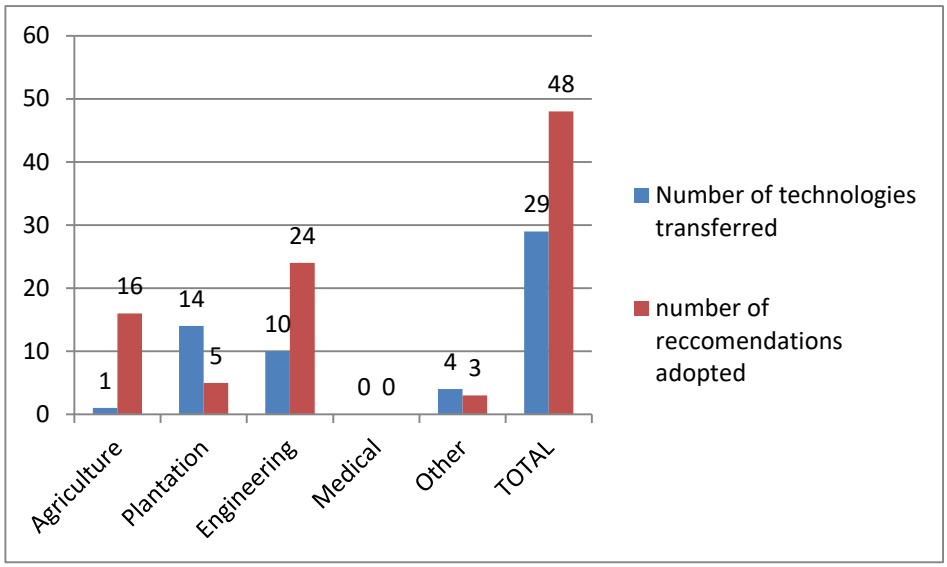


Figure 6.2: Number of technologies transferred & recommendations adopted by sector - wise S&T institutions

6.8 Barriers faced in technology transfer / extension

This survey identified the following reasons as barriers to transfer technologies by S&T institutions,

- Poor linkage between R&D sections and the industry
- Lack of human resources for technology transfer / extension and ineffective services
- Delay in financial procedures and the high cost of expenditure
- Lack of cooperation and priority of the relevant authority
- Unable to retain quality research staff / high turnover of research staff
- Long drawn out processes and poor profitability due to high costs of inputs and labor
- Unwillingness of investors due to poor interest in perceiving innovative technologies
- Unavailability of a properly developed national level mechanism (National policy for technology transfer)
- Unnecessary bureaucracy in recruitment of staff and in filing vacancies.

7. Services provided by S&T institutions

The services provided by S&T institutions were measured by considering client base approaches in testing, calibrations, trainings, product and process certifications, accreditation of labs, and consultancies. The number of clients served by S&T institutions is given in Table 7.1. Testing facility was the widely used service while the least used was accreditation services. Out of 37 S&T Institutions, five institutions namely, NIFS, SLCARP, PPS, Forest Department and SCPPS did not provide S&T services that were identified in this study. NARA could not provide the details of number of clients served, although it generated revenue from conducting tests, calibrations and consultancies.

Medical sector provided the highest number of testing services, Agriculture sector offered the highest number of trainings and Engineering sector conducted the highest number of consultancies. Details of types of services offered by each sector are given in Table 7.1.

Table 7.1: Breakdown of types of services by S&T institutions

Sector	Testing	Calibration	Training	Product and Process Certification	Accreditation Services	Consultancies
Agriculture	34,172	17	162,584	758	9	1,330
Plantation	21,504	79	2,992	0	0	1,975
Engineering	4,149	126	572	28	0	2,657
Medical	299,297	0	350	0	0	0
Other	29,346	9,559	43,332	1,461	73	542
Total	**388,468**	**9,781**	**209,830**	**2,247**	**82**	**6,504**

It is important to note that the income generated by the state funded institutions had improved in comparison to the income generated in the previous years. In 2016, LKR 1,158.43 Million generated compared to LKR 789 Million in 2015.

Testing services was the highest revenue generator (41.7%), followed by consultancy services (22.8%).

Table 7.2: Revenue generated by rendering different services by S&T institutions

Services provided	Revenue generated/LKR Million	%
Testing	482.8	41.7
Calibration	57.32	4.9
Training	74.35	6.4
Product/Process certification	225.98	19.5
Accreditation	28.99	2.5
Consultation	264.32	22.8
Other	24.67	2.1
Total	**1,158.43**	**100.0**

The highest amount of revenue was generated by SLSI (LKR 447 Million), which contributed to the total revenue generation by 38.6%. SLSI, NBRO and ITI contributed for 88% of the total revenue. The revenue generated by S&T institutes are given in Table7.3.

Table 7.3: Revenue generated by S&T institutes

Revenue generated			
0-9 LKR/Million	10-20 LKR/Million	21-100 LKR/Million	>100 LKR/Million
FMRC	CEA	SLAB	ITI
HORDI	DM		NBRO
FRDI	ACIMT		SLSI
GSMB	TRI		
IPHT	NARA		
SLINTEC	NERD		
SCPPS			
GJRTI			

Recommendations

Recommendations are categorized under the following identified areas.

Leadership S&T

- Science and Technology (S&T) has always played a crucial role in development of societies through the provision of new / improved products and services, as well as enhanced economic activities. In Sri Lanka, state sector S&T institutions are distributed among 10 line ministries. S&T institutions focus on achieving separate action plans, which are established as per the goals of their respective ministry.

  The National S&T Policy and National Research & Development Framework (NDRF) are formulated with the participation of experts with the intention to drive R&D activities towards the national development processes. However, the survey revealed that the intended documents are not taken up by most of S&T institutions. Therefore, it is essential to establish a more powerful independent apex governing body to implement the national policy and monitor the institutional activities.

- Establishment of Presidential Task Force for S&T would be one of the suggestive ways to align, prioritize and expedite economically important R&D activities. This presidential task force can undertake goal oriented research to cover all aspects of development, particularly in the socially relevant sectors such as agriculture, education, healthcare, food, energy, water, minerals etc. In addition, it can serve as an instrument for rapid economic development with enhanced competitiveness by providing innovative technological inputs to the industrial sectors. Key Performance Indicators (KPI) can be used to define these goals to link to the deliverables associated with the schemes of ministries / departments. The task force needs to be empowered to ensure the on-time delivery through periodical reviewing. Further, the task force should be empowered to recommend the respective authorities to provide necessary resources in a timely manner, which eases the obstacles faced by institutions, not only in terms of R&D activities but also with the national goal alignment; i.e. human resources, finance, enabling ministerial linkages, availability of experts, national and international linkages, etc.

Human Resources & organizing structure in S&T institutions

- This survey accentuated the fact that funds allocated to R&D in Agriculture and Plantation sectors are comparatively higher than in 'Other' sector. As a country going towards market driven economy from agriculturally based economy, it is mandatory to invest in more economically identified R&D areas such as power & energy, telecommunication, IT construction and health care etc.
- Number of qualified researchers in Engineering and Medical Sciences should be increased. Proper analysis should be carried out to identify the areas where local researchers are lacking, and universities should be encouraged to produce more researchers in those demand driven areas.
- Recruitment criteria for scientific staff should be made less complicated. The existing government recruitment criteria for scientific staff is complex and the process continues for a prolonged period. To address the staff turnover, it is necessary to establish new recruitment criteria to absorb productive and efficient scientific staff within a short period.
- S&T institutions should create a conducive environment for researchers by producing ideal workplace facilities.
- The government should establish an administrative and financial support system to facilitate ongoing research. This system should ensure adherence to the rules and procedures while facilitating the implementation in accordance with the technical decisions of experts as well.
- A mechanism should be established to gain the support from Sri Lankan experts who serve in developed countries by arranging staff trainings and establishing useful links.
- New mechanisms and a framework are required to trigger R&D outputs for commercialization and development of marketable products and services.
- Establishment of a government protocol to encourage private industries to invest in public R&D activities.

S&T database

- Establishment of a national database on all public funded R&D activities is an essential factor. This would be important for decision-making, avoid of replication / duplication of research projects and programs. It will also enhance the research complementary.

Performance reviews and standardization

- Establishment of an efficient mechanism to conduct routine performance reviews of S&T institutions is needed. All the S&T institutions should essentially undergo a proper routine performance review within a stipulated time frame (i.e. every 3 years). An independent expert panel with high level of competence should do this review. It should be streamlined by an apex body with the support of respective attached ministries. Conducting timely performance reviews must be a responsibility of the respective S&T institution. Every ministry with S&T institutions should strictly follow up the progress of institutional performance reviews, so that the output of these reviews can be taken for the relevant recommendations when S&T institutions request government funds for R&D.
- Every laboratory under taking R&D activities, product testing services and instrument calibration should be accredited by accreditation authority and each institution should be able to come up with their own standardization framework within a reasonable period.

ANNEXURE 01

National Review of the Status of S and T in Sri Lanka – Year 2016

Questionnaire Survey

Objective of the Survey:

The National Science and Technology Commission (NASTEC) is mandated to submit an annual report to the Government of Sri Lanka on the status of S&T in the country. The information provided by you will be used only in the preparation of this report.

Please read the instructions and definitions attached to this questionnaire before you fill the questionnaire. **All the questions are relevant to activities carried out during year 2016.**

(I) GENERAL INFORMATION

1. Name of the Institution:
2. Postal Address:
3. Telephone:
4. E-Mail
5. Fax:
6. Ministry/ Department :
7. Statutory functions: (Please select relevant cage/s by a "x")

R & D		S&T policy formulation	
Research funding		Technology transfer	
S&T services		Science popularization	

8. Please list any other major functions of your institution.

(II) HUMAN RESOURCES

(Please provide information on the permanent staff)

A) Staff Strength

i) Scientific, accounting & administrative staff (head count)

Scientific			Accounting		Administration		Other
Research Staff	Support Staff	Librarians Information Officers	Accountants	Support Staff	Executives	Support Staff	

ii) Research staff based on areas of expertise & gender (head count)

Science		Engineering		Medical & Health Science		Agriculture		Veterinary Science		Other	
M	F	M	F	M	F	M	F	M	F	M	F

iii) Highest level of qualification of research staff based on gender (head count)

Doctoral Degree		MPhil Degree		MSc/MA Degree		Bachelor's Degree		Diploma	
M	F	F	M	M	F	M	F	M	F

iv) Research staff by age group & gender (head count)

>50 Years		40-50 Years		30-40 Years		<30 Years	
M	F	M	F	M	F	M	F

v) Staff remunerations

Categories of scientific staff	Salary scale	Minimum qualification sought at recruitment

B) HR Development

i) Staff trained at workshops, seminars and conferences (local and international) (head count)

Titles of training programmes	Duration	For whom (ROs/ SOs/TOs etc.)	Number participated

ii) Postgraduate degrees funded by institution for staff members

Name and Designation	Degree programme	Duration
-		

iii) Scientific staff recruited by the institution within the year

Category	Highest qualification	Number
-		

iv) Scientific staff that left the institution within the year

Category	Reasons for leaving	Number

v) Perks given to scientific staff

Perks	For whom	Amount (Rs)

(III) PHYSICAL RESOURCES

i) Infrastructure Facilities

Infrastructure facility	Number

ii) Other facilities

Facility	Availability (Yes/No)

iii) Major equipment available

Name of Equipment	Number	Year of purchase

iv) IT facilities

Facility	Number	
	Scientific staff	Administration staff

(Iv) RESEARCH PLANNING

I. Source documents referred in the preparation of Annual action plan of the institute

National Research and Development Framework (NRDF)	YES		NO	
National Science and Technology Policy	YES		NO	

Other Documents

II. NRDF based activities identified/ implemented

Activity	**Level of Implementation**

(v) RESEARCH INPUTS

i) Funds received for research work during the year

Source of funding (Treasury/NSF/NRC /foreign funds etc.)	Amount requested (Rs.)	Amount received (Rs)	Amount spent (Rs.)

iv) If the funds received are not spent (there is a balance) what are the reasons?

v) Funds allocated to upgrade the institution

Source of funding	For what	Amount received (Rs)	Whether the task is completed

(VI) RESEARCH OUTPUTS

i) Research Projects

Broad area of the research projects	Collaboration (International, other organizations, universities	Main Issues addressed by the research project)	Ongoing/completed

ii) New products/ processes/ technologies developed through research

(Please list)

Processes	Technologies	Products

iii) No. of publications

Publications	Number of publications

iv) Patents received by scientists/ institution

(Please list)

Item patented	Whether National/International	Whether implemented or sold

v) Awards received by scientists/ institution

Award received	For what	Whether National/International
-		

vi) What are the products/ processes commercialized by the institution?

(Please list)

Processes	Products

vii) How did the commercialization happen?

viii) If the institution was unable to commercialize the product/process what are the reasons/ barriers?

ix) What are the technologies transferred or recommendations (especially agriculture) adopted by industry/ farmers?
(Please list)

Technologies transferred	Recommendations adopted

x) What are the barriers faced in technology transfer?

(VII) SERVICES (FOR INDUSTRIES, S&T INSTITUTIONS, GENERAL PUBLIC)

Types & Area of services (please list)	Number of clients served	Revenue earned (Rs)