

CHAPTER III

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RESEARCH AND DEVELOPMENT IN THE CENTRAL SECTOR

Realizing the need to receive a substantial gain through the application of Science & Technology for the upliftment of the economy, Central (or Federal) Government continued to shoulder the major share of the financial resources devoted to Research and Development activities. The share of Central Government including Public Sector R&D units and Higher Education Sector was 66.4% in 2005-06. The Higher Education Sector constitutes 4.4% of National R&D expenditure in 2005-06. In absolute terms, the total R&D expenditure of the Central Government inclusive of Public Sector industry (called as Central Sector) has increased from Rs. 12251.17 Crores in 2002-03 to Rs. 17851.01 Crores in 2005-06. By applying the appropriate growth as observed over a period of time starting from 2001-02 to 2005-06 the R&D expenditure for Central Sector is estimated to reach a level of Rs. 19909.23 Crores in 2006-07 and Rs. 22204.77 Crores in 2007-08.

With the present trend of share in R&D expenditure by Central Sector, the rate of growth for

the years 2003-04, 2004-05 and 2005-06 over the previous year was 6.4%, 15.7% and 18.4% respectively. It may be seen from Table 3.1 that the annual (year to year) growth rates of R&D expenditure at constant prices (Base 1999-00) from 1993-94 onwards showed an upward trend from 1996-97 to 1999-00 then had a sudden fall to 1.3% in 2001-02. Then, it started rising again and rose to 14.0% in 2005-06.

R&D expenditure at constant prices has been worked using GNP price deflators. The annual growth rate of Central Sector R&D expenditure at current prices at 1999-00 has a similar trend. The lowest growth rates were recorded both at current and constant prices for the years 1994-95 and 2001-02. The growth rates in real terms for R&D expenditure in some years were quite small that practically there was no increase in the R&D expenditure after adjusting for inflation except in the year 1999-00 but it was once again showing an upward trend from 2002-03 to 2005-06.

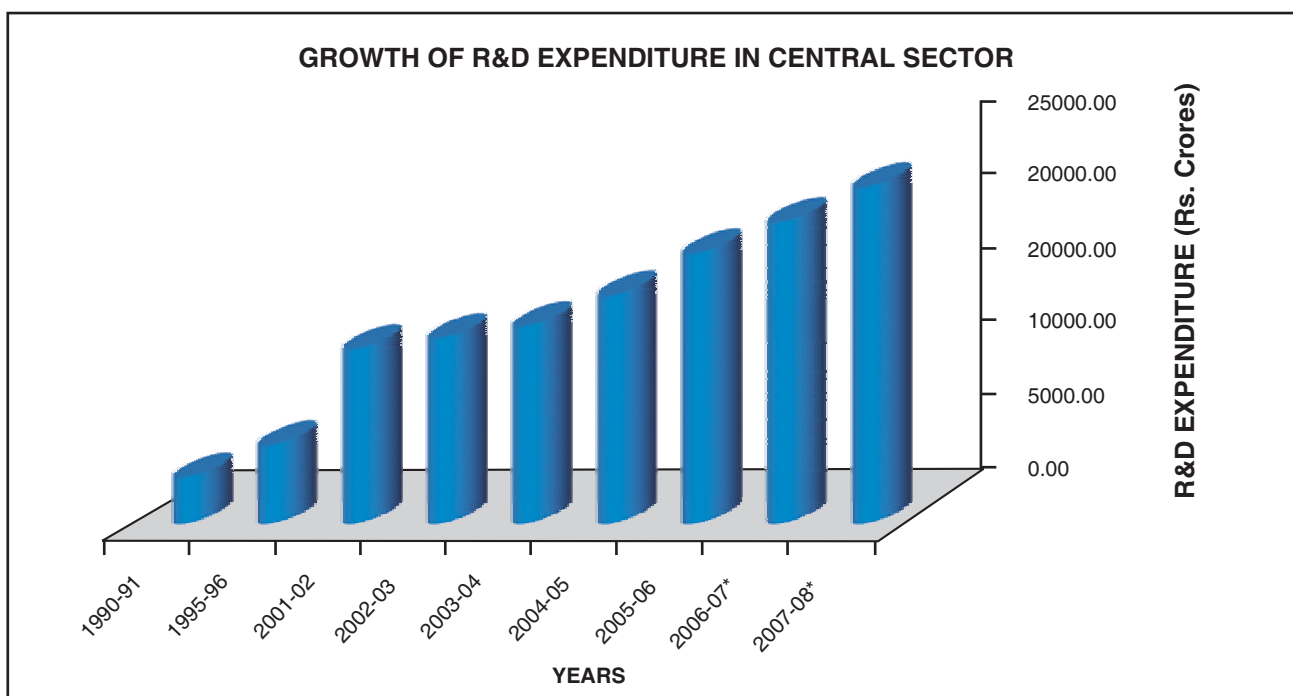


Table 3.1**ANNUNAL GROWTH OF CENTRAL SECTOR R&D EXPENDITURE**

Year	Rate of growth in percentage (Over the previous year)	
	At current Prices	At constant prices (Base 1999-00)
1993-94	23.6	12.4
1994-95	4.0	(-)5.30
1995-96	10.4	1.0
1996-97	10.2	2.1
1997-98	20.2	12.9
1998-99	22.2	13.1
1999-00	16.8	12.4
2000-01	12.5	8.9
2001-02	4.4	1.3
2002-03	6.2	2.2
2003-04	6.3	3.0
2004-05	15.8	9.6
2005-06	18.4	14.0

The Central Government R&D expenditure inclusive of Public Sector and Higher Education Sector is classified by thirteen socio-economic objectives as laid down by the UNESCO. Ideally, this exercise ought to be done on project to project basis, but due to operational problems, it has not been possible to do so. Hence, each R&D institution has been assigned to a specific objective based upon its predominant activity. The percentage share of total R&D expenditure of Central Government for some of the objectives for the year 2005-06 is given in Table 3.2

It may be seen from Table 3.2 that R&D institutions under Central Sector including Higher Education and Public Sector spent 73.9% of Central Government R&D expenditure on four objectives such as Defence, General Advancement of Knowledge, Space, Development of Agriculture, Forestry and Fishing during 2005-06. The maximum R&D expenditure was on Defence, which accounted for 30.8%. This was followed by General Advancement of Knowledge with 18.8%. More or less, a similar trend was observed in the past also with variations in inter-se percentage of the above objectives

Table 3.2**PERCENTAGE SHARE OF CENTRAL SECTOR R&D EXPENDITURE
BY OBJECTIVE, 2005-06**

Objective	Percentage
Defence	30.8
General Advancement of Knowledge	18.8
Space	14.3
Development of Agriculture, Forestry and Fishing	10.0
Production Conservation and Distribution of Energy	9.1
Development of Health Services	5.9
Promotion of Industrial Development	4.1
Exploration and Assessment of Earths, Seas, Atmosphere, etc.	2.7
Development of Transport & Communication	2.6
Protection of Environment	0.9
Other aims	0.7
Total	100.0

The percentage share of Central Government including Public Sector industries and Higher Education Sector in National R&D expenditure by objectives for the year 2005-06 is shown in Table 3.3. Almost all of the R&D expenditure in Strategic areas like Space and Defence were borne by Federal Government. Even

1. R&D organizations under Major Scientific Agencies i.e. Organisations which have R&D or promotion of S&T as their predominant activity.
2. R&D organizations under Other Central Ministries/Departments i.e. Organisations which

Table 3.3

PERCENTAGE SHARE OF CENTRAL GOVERNMENT (INCLUDING PUBLIC SECTOR AND HIGHER EDUCATION SECTOR) OUT OF NATIONAL R&D EXPENDITURE BY OBJECTIVE, 2005-06

Objective	Percentage
Space	99.9
Defence	99.1
Exploration and Assessment of Earth Seas & Atmosphere	95.1
General Advancement of Knowledge	94.2
Protection of Environment	68.8
Production Conservation and Distribution of Energy	90.8
Promotion of Industrial Development	44.3
Development of Agriculture, Forestry and Fishing	43.9
Social Development and Other Socio-economic Services	41.8
Development of Transport & Communication	28.0
Other Aims	7.7
Development of Health Services	25.5
Urban & Rural Planning	83.4
Percentage Share in National R&D Expenditure	67.6

in the case of Exploration and Assessment of Earth, Seas, Atmosphere, General Advancement of Knowledge and Production Conservation and Distribution of Energy more than 90.0% of R&D expenditure was spent by Central (Federal) Government.

The percentage share of the R&D expenditure by field of science by Central Government including Public Sector industries and Higher Education Sector during 2005-06 was 55.8%, 23.3%, 12.6% and 4.9% for Engineering and Technology, Natural Sciences, Agricultural Sciences and Medical Sciences respectively. 3.4% of the Central Government R&D expenditure was for social sciences area.

For the purpose of statistical analysis, S&T institutions under central government are grouped as follows:

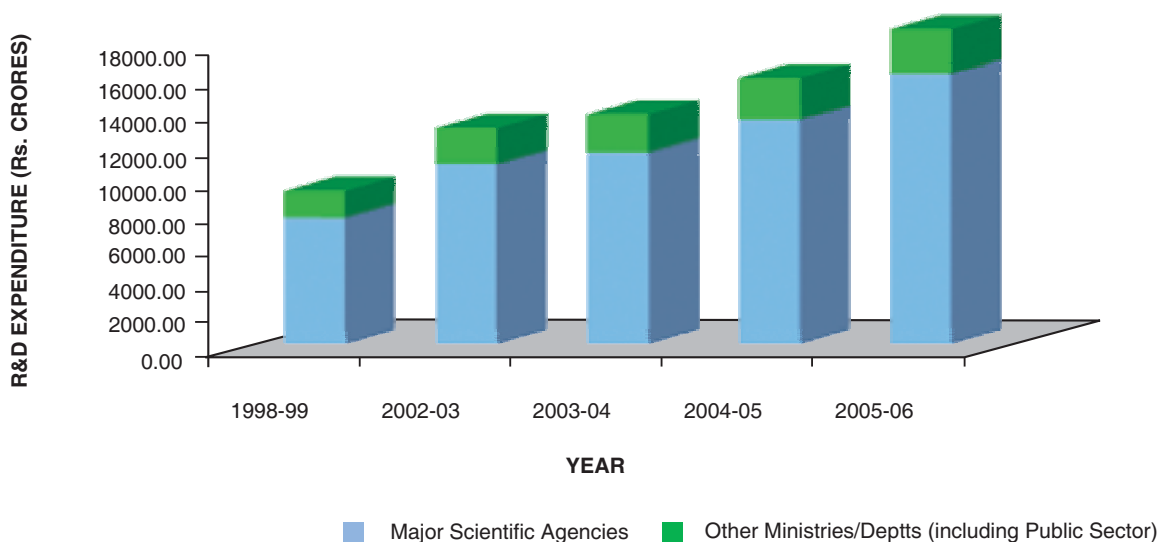
undertake R&D work occasionally in connection with their day-to-day problems.

3. In-house R&D units of Public Sector Industry.

The share of R&D expenditure during 2005-06 by the 12 Major Scientific Agencies in the total Central Sector R&D expenditure including Public Sector R&D units was 86.0%. This forms 53.3% of the National R&D expenditure. It has risen from Rs. 6929.96 Crores in 1998-99 to Rs. 10228.63 Crores in 2002-03 to Rs. 15347.48 Crores in 2005-06 for these agencies. Similarly R&D expenditure for other Ministries/Departments including Public Sector R&D units increased from Rs. 1482.20 Crores in 1998-99 to Rs. 2022.54 Crores in 2002-03 to Rs. 2503.53 Crores in 2005-06.

The shares of R&D expenditure by Major Scientific Agencies, Other Central Ministries/

CENTRAL GOVERNMENT R&D EXPENDITURE BY MAJOR SCIENTIFIC AGENCIES AND OTHER MINISTRIES/DEPARTMENTS

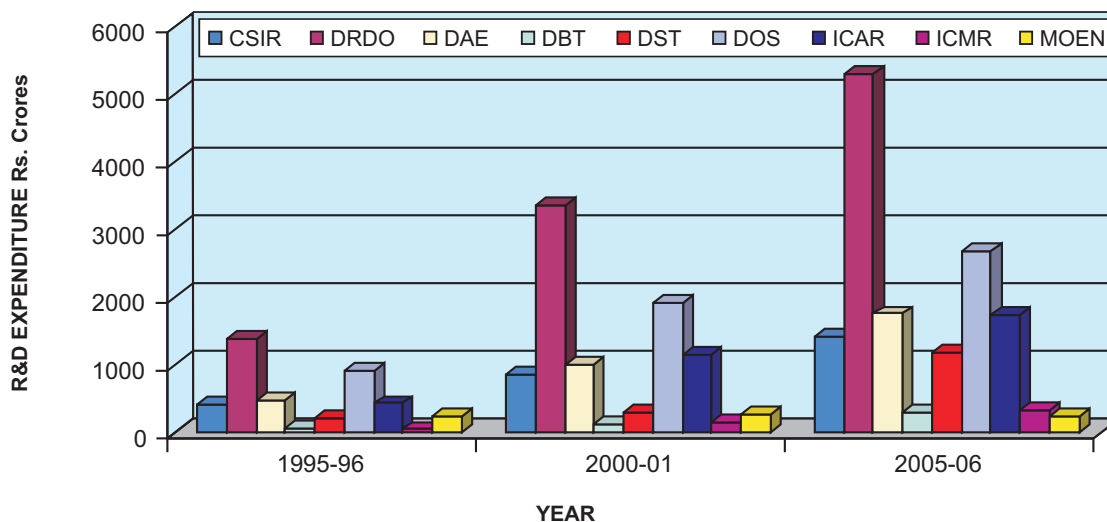


Departments and Public Sector in total Central Sector R&D expenditure for 2005-06 were 86.0%, 6.7% and 7.3% respectively.

Table 3.4 shows the percentage share of R&D expenditure among Major Scientific Agencies. The Table indicates that 91.6% of total R&D expenditure

of major scientific agencies was shared by six agencies viz. Defence Research and Development Organization (DRDO), Department of Space (DOS), Department of Atomic Energy (DAE), Indian Council of Agricultural Research (ICAR), Council of Scientific and Industrial Research (CSIR), and Department of Science and Technology (DST). Defence Research

R&D EXPENDITURE BY SELECTED CENTRAL GOVERNMENT SCIENTIFIC AGENCIES



and Development Organization (DRDO) alone accounts for a share of 34.4%.

The R&D expenditure of the central sector can be divided into institutional R&D and industrial R&D. The industrial R&D expenditure in the central sector is expenditure incurred by the in-house R&D units of the Public Sector industry. For 2005-06, the share of Public Sector industry R&D expenditure in the total Central Sector R&D expenditure was 7.3% and the remaining 92.7% was incurred by R&D institutions in the central sector.

In all, there are 13 Cooperative Research Associations representing different industries such as textiles, plywood, rubber, automotive, electrical, tea and cement. These Cooperative Research Associations are financed jointly by the Government and the members of the concerned industry. The R&D expenditure incurred by these Associations had increased from Rs. 52.84 Crores in 1998-99 to Rs. 160.97 Crores in 2005-06 (see table 7).

Table 3.4

INTER-SE PERCENTAGE SHARE OF R&D EXPENDITURE BY MAJOR SCIENTIFIC AGENCIES 2005-06

Agency	Percentage
Defence Research and Development Organization	34.4
Department of Space	17.4
Department of Atomic Energy	11.4
Indian Council of Agricultural Research	11.4
Council of Scientific and Industrial Research	9.3
Department of Science and Technology	7.7
Indian Council of Medical Research	2.2
Others	6.2
Total	100.0

With regard to the manpower employed in R&D establishments, as on 1st April, 2005, there were 2,11,022 personnel employed in the central sector R&D units. This was 53.9% of total national manpower employed in all R&D units in the country. The above figure is inclusive of 14644 personnel employed in R&D units of Public Sector Undertakings.

Out of the total 2,11,022 personnel employed in R&D establishments under Central Government, 65513 personnel were primarily engaged in R&D activities comprising 56,232 R&D personnel in Central Government institutional sector and 9281 R&D personnel in the in-house R&D units of Public Sector Industry. The manpower employed in R&D establishments of Central Sector were either engaged in research and development work or were extending technical support for research and development (termed as auxiliary personnel) or provided administrative support for research activities. The percentage break up of total manpower employed in Central Government inclusive of Public sector industry according to three types of activities was 31.0% in R&D, 33.9% in auxiliary and 35.1% in administrative activities.

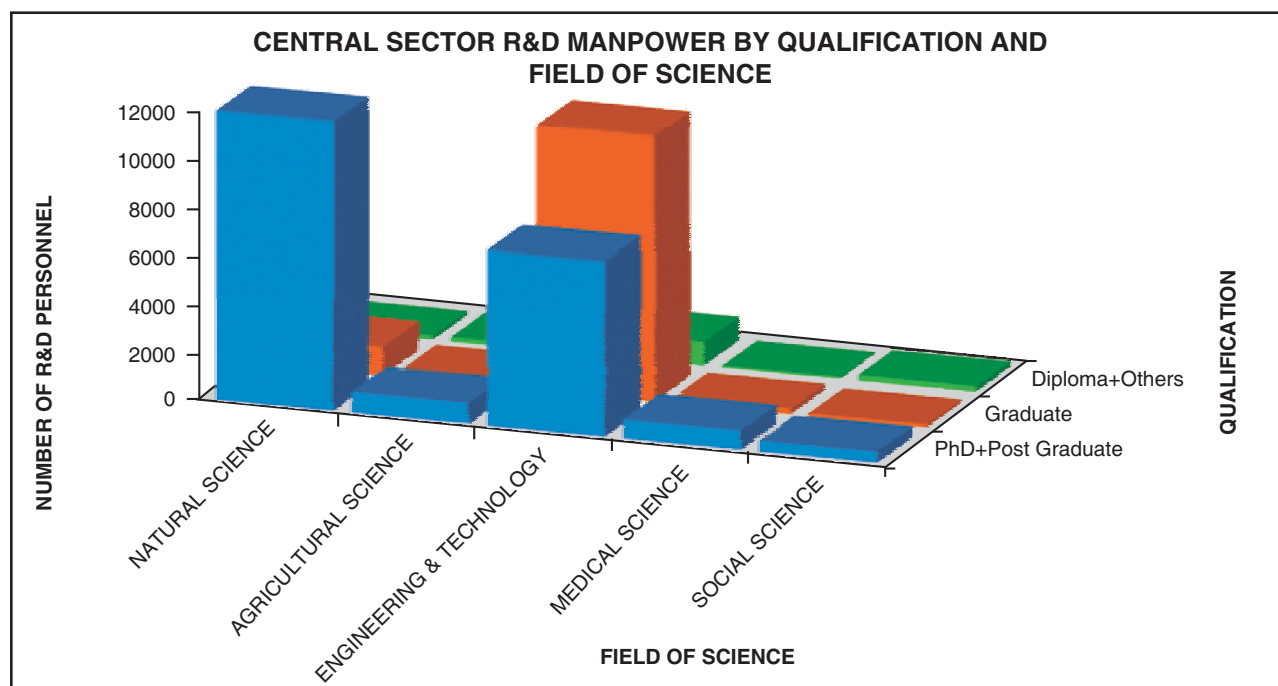
As on 1st April 2005, 61050 women were employed in R&D establishments in the country. Out of this 36864 (60.1%) were employed in the Central Sector including Public Sector R&D units. Out of 19,707 women S&T personnel directly engaged on R&D activities at the national level, the share of Central Sector inclusive of Public sector was 54.7%. It is seen that for every 100 R&D employees in Central Sector including Public Sector about 16.4% were women R&D employees.

Out of every 100 women employed in Central Sector, 29.2% were engaged directly in R&D activities, 28.1% were performing auxiliary activities and 42.6% were providing administrative support. The percentage of women working for Administrative activities is quite high as compared to working for R&D and auxiliary activities.

Out of 56,232 R&D personnel employed in the Central Government excluding Public Sector field of specialization and qualification were known only for 48742 R&D personnel. Engineering and Technology background personnel shared 48.5% followed by Natural Scientists 36.5%, Agricultural Scientists 8.8%, Medical personnel 3.7% and Social Scientists 2.5%. 9,281 R&D personnel were engaged in R&D activities in public sector showing dominance of R&D personnel with Engineering and Technology background (83.8%). By level of qualifications, R&D personnel engaged in Central Government excluding public sector, comprised

of 20.3% PhDs, 43.7% of Post Graduates, 26.2% of Graduates and 9.9% of Diploma Holders and other qualifications. Personnel with Engineering and technology background dominated among the R&D

personnel of Central Government sector. Analysis of educational qualification shows that 63.9% of R&D personnel had Post Graduate and above qualification in Central Government excluding public sector.



Note: Out of 56232 R&D personnel information was available for 48079 R&D personnel

To sum up, the salient features as under:

- ❖ Central Government including Public Sector industry and Higher Education Sector continued to shoulder a major share of national R&D expenditure, which was 66.4% during 2005-06.
- ❖ In absolute terms, Central Government incurred Rs.19105.02 Crores on R&D during 2005-06.
- ❖ Annual rate of growth for R&D expenditure at current prices for 2005-06 over the previous year was 18.4%. The same at constant prices (Base 1999-00) was 14%.
- ❖ By socio-economic objectives as defined by UNESCO, the Defence R&D accounted for 30.8% of Federal R&D expenditure during 2005-06.
- ❖ Nearly Cent percent of R&D expenditure on Defence and Space was borne by Central Government including Public Sector R&D units during 2005-06.
- ❖ Major share (86%) of Central Government R&D expenditure was accounted for by 12 Major Scientific Agencies.
- ❖ About 2.11 lakhs personnel were engaged in R&D units of the institutional and Public Sector industry under Central Sector and out of this 31% were primarily engaged in R&D, 33.9% in auxiliary activities and 35.1% were providing administrative support.
- ❖ For every 100 R&D employees in Central Sector 16.4% were women R&D employees.
- ❖ R&D personnel with engineering and technology background dominated the Central Government R&D manpower excluding public sector (48.5%).
- ❖ 64% of Central Government R&D Manpower possessed Post Graduate and above qualification.