

CHAPTER III

RESEARCH AND DEVELOPMENT IN THE CENTRAL SECTOR

Realising 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 marginally increased from 70.5% in 1998-99 to 71.2% in 2002-03. The Higher Education Sector constitutes 4.2% of National R&D expenditure in 2002-03. 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. 8412.16 crores in 1998-99 to Rs. 12072.98 crores in 2002-03. By applying the appropriate growth as observed over a period of time starting from 1998-99 to 2002-03, the R&D expenditure for Central Sector is estimated to reach a level of Rs. 14443.36 crores in 2004-05.

With the present trend of share in R&D expenditure by Central Government, the rate of growth for the years 2000-01, 2001-02 and 2002-03 over the previous year was 12.5%, 4.5% and 4.7% 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 1993-94) from 1984-85 onwards were much lower than what was observed in the first half of eighties

except in 1998-99 but it was once again showing an upward trend from 1997-98 to 1999-00 with a sudden fall to 0.5% in 2002-03.

R&D expenditure at constant prices has been worked using GNP price deflators. The annual growth rate of Central Government R&D expenditure at current prices at 1993-94 has a similar trend. The lowest growth rate was recorded both at current and constant prices for the year 1990-91 over 1989-90. The growth rates in real terms for R&D expenditure in some years were so small that practically there was no increase in the R&D expenditure after adjusting for inflation except in the year 1993-94 but it was once again showing an upward trend from 1996-97 to 1998-99 and observed declining trend for the rest of the period.

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 2002-03 is given in Table 3.2

Table 3.1

GROWTH IN CENTRAL SECTOR R&D EXPENDITURE

Year	Rate of growth in percentage (Over the previous year)	
	At current Prices	At constant prices (Base 1993-04)
1981-82	24.4	12.9
1984-85	35.5	25.5
1985-86	16.3	8.7
1989-90	9.7	1.3
1990-91	4.2	(-) 5.6
1991-92	13.4	(-) 0.4
1992-93	5.7	(-) 2.8
1993-94	23.6	12.6
1994-95	4.0	(-) 5.1
1995-96	10.4	1.3
1996-97	10.2	2.6
1997-98	20.2	12.6
1998-99	22.2	13.1
1999-00	16.8	12.5
2000-01	12.5	8.7
2001-02	4.5	1.0
2002-03	4.7	0.5

Table 3.2

PERCENTAGE SHARE OF CENTRAL SECTOR R&D EXPENDITURE BY OBJECTIVE, 2002-03

Objective	Percentage
Defence	25.6
Space	18.0
General Advancement of Knowledge	16.7
Development of Agriculture, Forestry and Fishing	12.4
Production Conservation and Distribution of Energy	7.7
Promotion of Industrial Development	6.3
Development of Health Services	3.6
Protection of Environment	2.6
Exploration and Assessment of Earths, Seas, Atmosphere etc.	2.3
Development of Transport & Communication	1.5
Other aims	3.3
Total	100.0

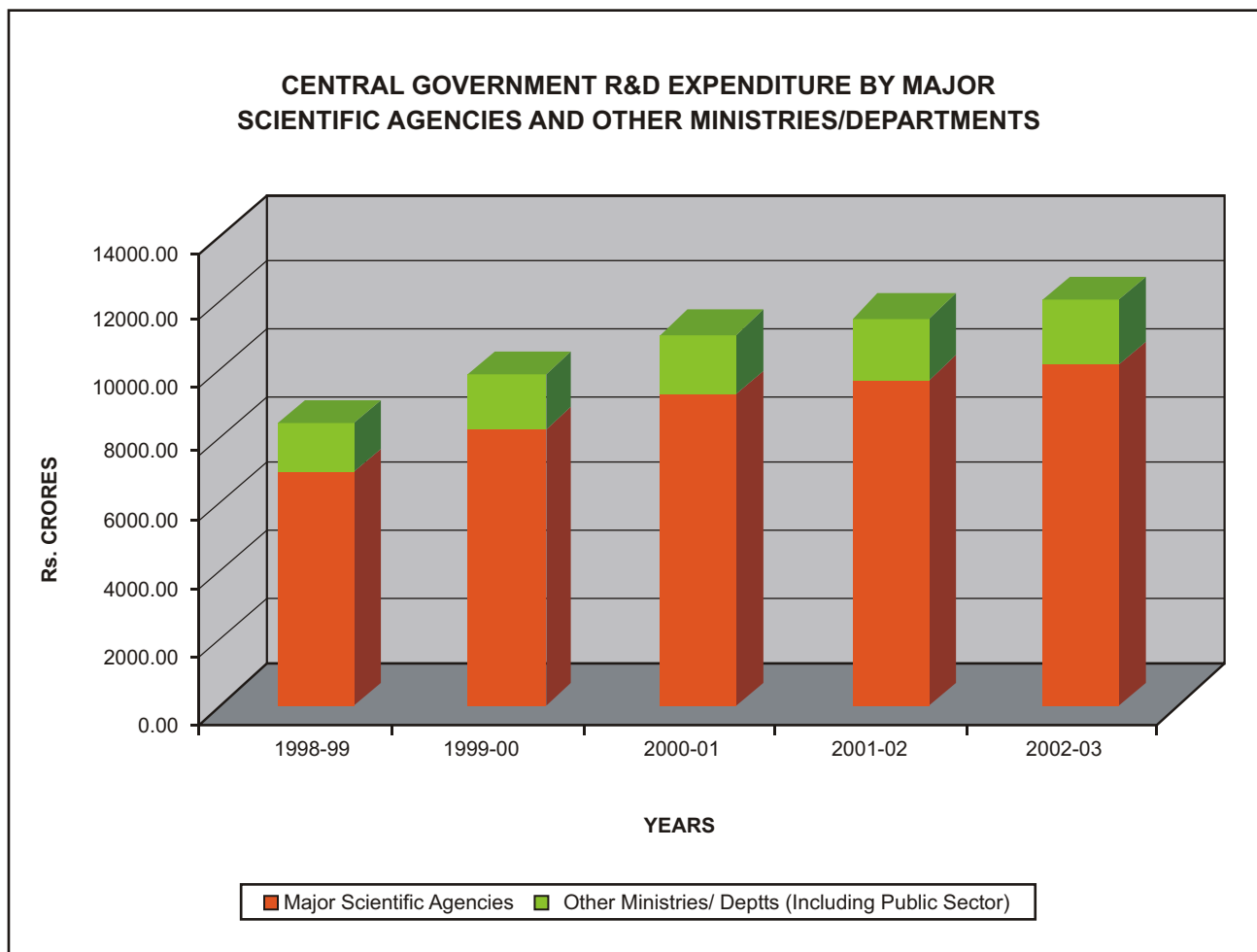
It may be seen from Table 3.2 that R&D institutions under Central Government spent 72.7% of Central Sector R&D expenditure on four objectives such as Defence, Space, General Advancement of Knowledge, Development of Agriculture, Forestry and Fishing during 2002-03. The maximum R&D expenditure was on Defence, which accounted for 25.6%. This was followed by Space with 18.0%. More or less, a similar trend was observed in the past also with variations in inter se percentage of the above objectives.

The percentage share of Central Sector including Public Sector industries and Higher Education Sector in National R&D expenditure by objectives for the year 2002-03 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 in the case of Protection of Environment, Exploration and Assessment of Earth, Seas, Atmosphere and General Advancement of Knowledge, more than 95% of R&D expenditure was spent by Central (Federal) Government.

Table 3.3

PERCENTAGE SHARE OF CENTRAL GOVERNMENT (INCLUDING PUBLIC SECTOR AND HIGHER EDUCATION SECTOR) OUT OF NATIONAL R&D EXPENDITURE BY OBJECTIVE, 2002-03

Objective	Percentage
Space	99.7
Defence	99.2
Exploration and Assessment of Earth Seas & Atmosphere	98.5
General Advancement of Knowledge	97.7
Protection of Environment	96.3
Production Conservation & Distribution of Energy	87.7
Promotion of Industrial Development	48.0
Development of Agriculture, Forestry & Fishing	47.7
Social Development and Other	
Socio-economic Services	34.3
Development of Transport and Communication	27.6
Other Aims	58.4
Development of Health Services	28.8
Percentage share in National R&D Expenditure	71.2



The percentage share of the R & D expenditure by field of science by Central Government including Public Sector industries and Higher Education Sector during 2002-03 was 62.5, 24.2, 11.3 and 2.0 for Engineering and Technology, Natural Sciences, Agricultural Sciences and Medical Sciences respectively.

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

- a. R&D organisations under major Scientific Agencies i.e. Organisations which have R&D or promotion of S&T as their predominant activity.
- b. R&D organisations under other central ministries/departments i.e. Organisations which undertake R&D work occasionally in connection with their day-to-day problems.
- c. In-house R&D units of Public Sector Industry.

The share of R&D expenditure during 2002-03 by the 12 Major Scientific Agencies in the total Central Sector R & D expenditure including Public Sector R&D units was 84.1%. This forms 56.4% of the National R&D expenditure. It has risen from Rs. 6929.96 crores in 1998-99 to Rs. 10154.97 crores in 2002-03 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. 1918.01 crores in 2002-03. The shares of R&D expenditure by major scientific agencies, other central ministries/departments and Public Sector in total central sector R&D expenditure for 2002-03 were 84.1%, 9.2% and 6.7% respectively.

Table 3.4 shows the percentage share of R&D expenditure among major scientific agencies. The Table indicates that 86.7% of total R&D expenditure of major scientific agencies was shared by five agencies viz. Defence Research and Development Organisation (DRDO), Department of Space (DOS), Indian Council of Agricultural Research (ICAR), Department of Atomic Energy (DAE), & Council of Scientific and Industrial Research (CSIR). Defence Research and Development Organisation (DRDO) alone accounts for a share of 30.3%.

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 2002-03, the share of Public Sector industry R&D expenditure in the total central sector R&D expenditure was 6.7% and the remaining 93.3% was incurred by R&D institutions in the central sector.

Table 3.4

INTER-SE PERCENTAGE SHARE OF R&D EXPENDITURE BY MAJOR SCIENTIFIC AGENCIES 2002-03

Agency	Percentage
Defence Research & Development Organisation	30.3
Department of Space	21.3
Indian Council of Agricultural Research	13.5
Department of Atomic Energy	12.2
Council of Scientific & Industrial Research	9.4
Department of Science & Technology	5.0
Department of Environment	2.6
Others	5.7
Total	100.0

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. 58.48 crores in 2000-01 (see table 7).

With regard to the Manpower employed in R&D establishments, as on 1st April, 2000, there were 1,77,511 personnel employed in the central sector R&D units. This was 59.9% of total national manpower employed in all R&D units in the country. The above figure is inclusive of 13674 personnel employed in R&D units of Public Sector Undertakings.

Out of the total 1,77,511 personnel employed in R&D establishments under Central Government, 49886 personnel were primarily engaged in R&D activities comprising 41,119 R&D personnel in Central Government institutional sector and 8767 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 28.1% in R&D, 36.4% in auxiliary and 35.5% in administrative activities.

As on 1st April 2000, 41198 women were employed in R&D establishments in the country. Out of this 24167 (58.7%) were employed in the Central Sector including Public Sector R&D units. Out of 11304 women S&T personnel directly engaged on R&D activities at the national level, the share of Central Sector inclusive of Public Sector was 54.6%. It is seen that for

every 100 R&D employees in Central Sector about 12.4% were women R&D employees.

Out of every 100 women employed in Central Sector, 25.5% were engaged directly on R&D activities, 30.5% were performing Auxiliary activities and 44.0% 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.

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 71.2% during 2002-03.
- In absolute terms, Central Government incurred Rs. 12823.52 crores on R&D during 2002-03.
- Annual rate of growth for R&D expenditure at current prices for 2002-03 over the previous year was 4.7%. The same in constant prices (Base 1993-94) was 0.5%.
- By socio-economic objectives as defined by UNESCO, the Defence R&D accounted for 25.6% of Federal R&D expenditure during 2002-03.
- Nearly Cent percent of R&D expenditure on Defence and Space was borne by Central Government including Public Sector R&D units during 2002-03.
- Major share (84.1%) of Central Government R&D expenditure was accounted for by 12 Major Scientific Agencies.
- About 1.77 lakhs personnel were engaged in R&D units of the institutional and Public Sector industry under Central Sector and out of this 28.1% were primarily engaged in R&D, 36.4% in auxiliary activities and 35.5% were providing administrative support.
- For every 100 R&D employees in Central Sector 12.4% were women R&D employees