

## **CHAPTER II**



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# SCIENTIFIC AND TECHNICAL MANPOWER

Scientific and Technical (S&T) manpower constitutes one of the major input resources to scientific and technological activities. It is also an indirect measurement of the strength of the country because of its activities. The planning and formulation of science policy requires the knowledge of the total numerical strength of the qualified human resources namely the total stock and the economically active stock of scientific and technical personnel. It is, therefore necessary to study in depth the range and the extent of availability of S&T manpower and their deployment pattern.

The Government of India appointed a Scientific Manpower Committee in 1947 to advice on the best methods of utilizing and augmenting the scientific

production, teaching, extension, management, administration, quality control, banking etc. They were employed in different types of organisations situated in far flung areas of the country. Keeping this in view, it was felt that a head count of total stock of S&T personnel at a frequent interval of time was not only time consuming and costly exercise but impracticable too.

Therefore, it was decided that this activity should be taken up along with the census survey. The first survey of S&T personnel was conducted along with the 1961 census of decennial population. As a result of this, particulars of 2.45 lakhs personnel were collected. The studies based on 1961 data on S&T personnel proved to be very useful in education and

**Table 2.1**  
**ESTIMATED STOCK OF S&T PERSONNEL IN 1999 AND 2001**

Field	Stock & S&T Personnel		Annual rate of Growth
	1999	2001	(%)
Engineering Degree Holders	913.7	1024.4	5.9
Engineering Diploma Holders	1379.5	1531.7	5.4
Medical Graduates	391.7	415.9	3.0
Agricultural Graduates	223.8	238.6	3.3
Veterinary Graduates	44.0	46.7	3.0
Science Graduates	3655.4	4024.9	4.9
Science Post Graduates	730.6	805.0	5.0
<b>Total</b>	<b>7338.7</b>	<b>8087.2</b>	<b>5.0</b>

manpower resources in the country. A scheme on national register for scientific and technical personnel was introduced. Since this registration was voluntary and the response was not upto the mark, this scheme could not serve the purpose of getting information on the stock of S&T personnel. Another problem was that S&T personnel were not only engaged in S&T activities but also in multifarious activities like

manpower planning. After a decade, in 1971, it was decided that the extent and coverage of this exercise be extended to all degree holders and technical personnel in all faculties. About 22 lakhs filled in questionnaires were received which helped to conduct a number of studies on S&T manpower planning.

The surveys of 1961 and 1971 were conducted on complete enumeration basis. However, at the time

of 1981 census, it was considered not feasible to have complete enumeration. Consequently, efforts were made to collect data on 20% sample basis in 12 states, while a complete enumeration was conducted in other states/union territories except the state of Assam. The total number of schedules of S&T personnel collected through degree holders and technical personnel surveys (DHTP) conducted in 1961, 1971 and 1981 were 2.45 lakhs, 8.79 lakhs and 16.45 lakhs respectively. During 1991, post graduate degree holders and technical personnel survey (PGDHTP) was undertaken along with census survey but could not meet the success.

The Planning Commission had undertaken exercises to estimate the stock of S&T personnel at the beginning and at the end of each plan period. The

This is followed by engineering diploma holders and science post graduates.

The stock of engineering degree and diploma holders are estimated to be 1.0 million and 1.5 million respectively in 2001. The science postgraduates are estimated to be 0.80 million in 2001.

As mentioned in Table 2.1, the total stock of S&T Manpower was estimated to be around 8.1 millions in 2001. Nevertheless, the annual out turn of S&T personnel as per University Grants Commission (UGC) was 6.09 lakhs during 2003. Due to the limited job opportunities available in the country all the S&T personnel are not gainfully employed. The data on the S&T personnel borne on the Live Register of

**Table 2.2**  
**BREAK-UP OF S&T PERSONNEL BORNE ON THE LIVE REGISTER OF**  
**EMPLOYMENT EXCHANGES - 2006**

<b>Discipline</b>	<b>Number of Live Register</b>	<b>Percentage</b>
Science Graduates Post-Graduates	1261.4	51.2
Engineering Diploma Holders	810.2	32.9
Engineering Degree Holders/Post-Graduates	276.7	11.2
Medical Graduates/Post-Graduates	60.7	2.5
Agricultural Graduates/Post-Graduates	47.2	1.9
Others (Veterinary Graduates/Post-Graduates)	6.7	0.3
<b>Total</b>	<b>2462.9</b>	<b>100.0</b>

Institute of Applied Manpower Research (IAMR) has estimated the stock of various categories of educational manpower upto 2001. The estimated stock figures are, in general, the extension of the 1981 stock estimates. The same set of assumptions and attrition rates have been used in these reports. The only added dimension is the projection of outturn figures. The outturn figures are worked out by applying appropriate wastage/stagnation rates to the estimated enrolment at different levels of education. According to Institute of Applied Manpower Research (IAMR), the field wise estimated stock of S&T personnel for the years 1999 and 2001 is shown in Table 2.1.

It may be seen from Table 2.1 that engineering degree holders have the highest growth rate of 5.9%.

Employment Exchange gives some indication on the unemployment status of S&T personnel though the data reported do not refer to the actual number of unemployed. This number was 12.1 lakhs in 1990 which increased to 20.6 lakhs in 2001 and to 24.6 lakhs in 2006. The discipline-wise break- up of registrants is given in Table 2.2.

It may be seen from Table 2.2 that nearly 51.2% of the registrants were science graduates/post-graduates, followed by 32.9% engineering diploma holders. In interpreting these figures it has to be borne in mind that all the persons registered with the Employment Exchanges are not necessarily unemployed. In addition all the unemployed persons

may not be registered with the Employment Exchanges.

The Department of Science and Technology, Government of India has been collecting information on the personnel employed in the R&D institutions and

administrative or non-technical support. The personnel engaged primarily in R&D activities and auxiliary activities are invariably S&T qualified. The information regarding the deployment of personnel in institutional sector and industrial sector of R&D establishments are provided in Table 2.3.

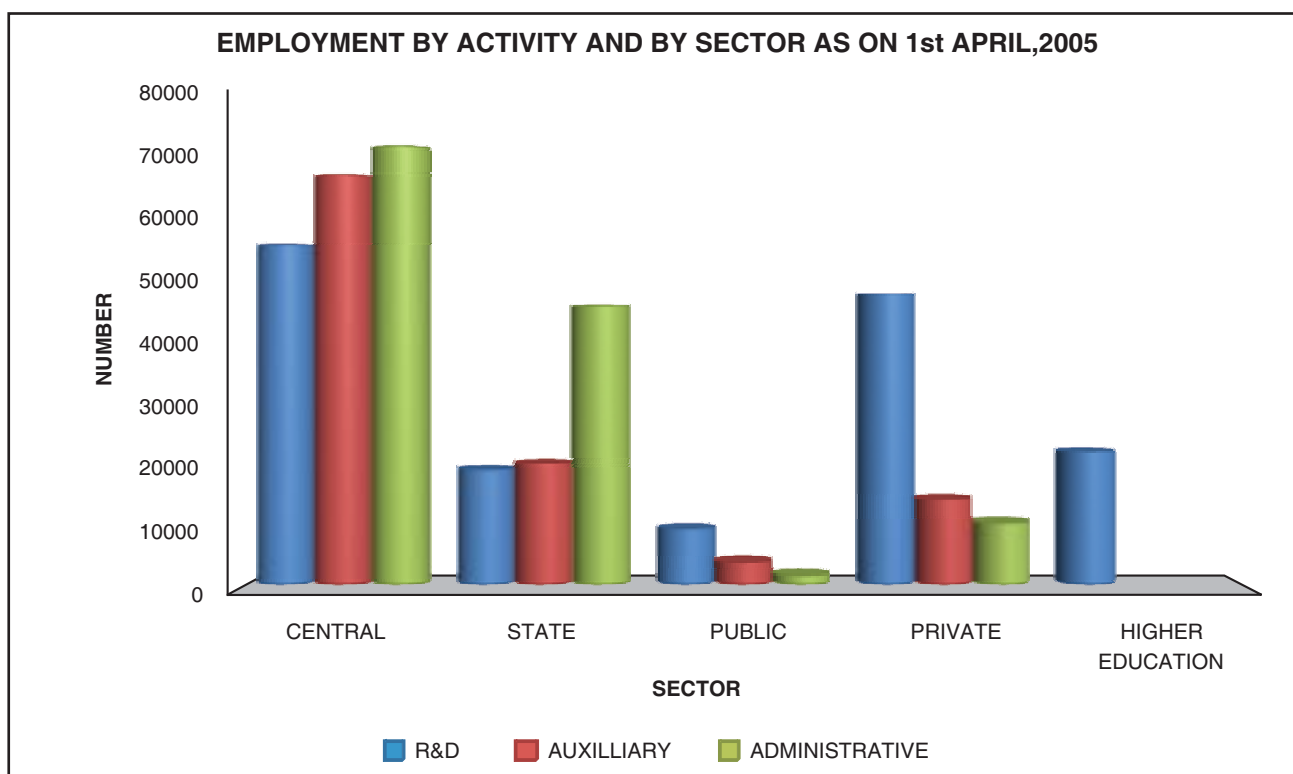
**Table 2.3**  
**PERCENTAGE DISTRIBUTION OF PERSONNEL**  
**BY TYPE OF EMPLOYER/ACTIVITY AS ON 1st April, 2005**

Percentage of Personnel employed				
Employer/Activity	R&D	Auxiliary	Administrative	Total
Institutional Sector	26.7	31.2	42.1	100
Industrial Sector	65.7	20.6	13.7	100
<b>Total</b>	<b>39.6</b>	<b>27.0</b>	<b>33.4</b>	<b>100</b>

Note: Break-up not available for Higher Education Sector

in house R&D units of public and private sectors in the country through a mail card survey since 1973. As on 1st April, 2005, 3,91,149 personnel were employed in research and development establishments. Out of these, 39.6 % were primarily engaged in R&D activities. 27.0 % were performing auxiliary (technical supporting) activities and 33.4 % were providing

It may be noted that there is no uniformity in the deployment pattern in both sectors, in case of R&D and administrative personnel, there is a large divergence. Industrial sector has comparatively higher proportion of personnel engaged in R&D activities and low proportion of personnel engaged in administrative activities compared to the institutional sector. This may



be on account of the fact that the administrative procedural requirements in the institutional sector need more manpower or the number of persons providing administrative support in industrial sector is not fully

employed in such establishments. The percentage of women by nature of activity was 12.7% (19,707) primarily engaged in R&D activities, 14.9% (15,802) in auxiliary activities and 19.6% (25,541) in

**Table 2.4**  
**NUMBER OF AUXILIARY AND ADMINISTRATIVE**  
**PERSONNEL PER R&D PERSON AS ON 1.4.2005**

Agency	Number of supporting personnel per R&D personnel *	
	Auxiliary	Administrative
Atomic Energy	1.70	1.20
Council of Scientific and Industrial Research	0.69	0.35
Defence Research & Development Organisation	1.55	1.50
Indian Council of Agricultural Research	1.26	2.42
Indian Council of Medical Research	2.15	2.08
Space	0.70	0.70
Other Ministries/ Departments	1.90	2.27
State Governments	1.05	2.41
Public Sector	0.41	0.17
Private Sector	0.29	0.22
<b>Overall R&amp;D Sector</b>	<b>0.79</b>	<b>0.97</b>

\* Based on response

reflected. In case of some of the industrial units, administrative facilities are common to R&D as well as other non-R&D activities and therefore, data on administrative personnel were not maintained separately.

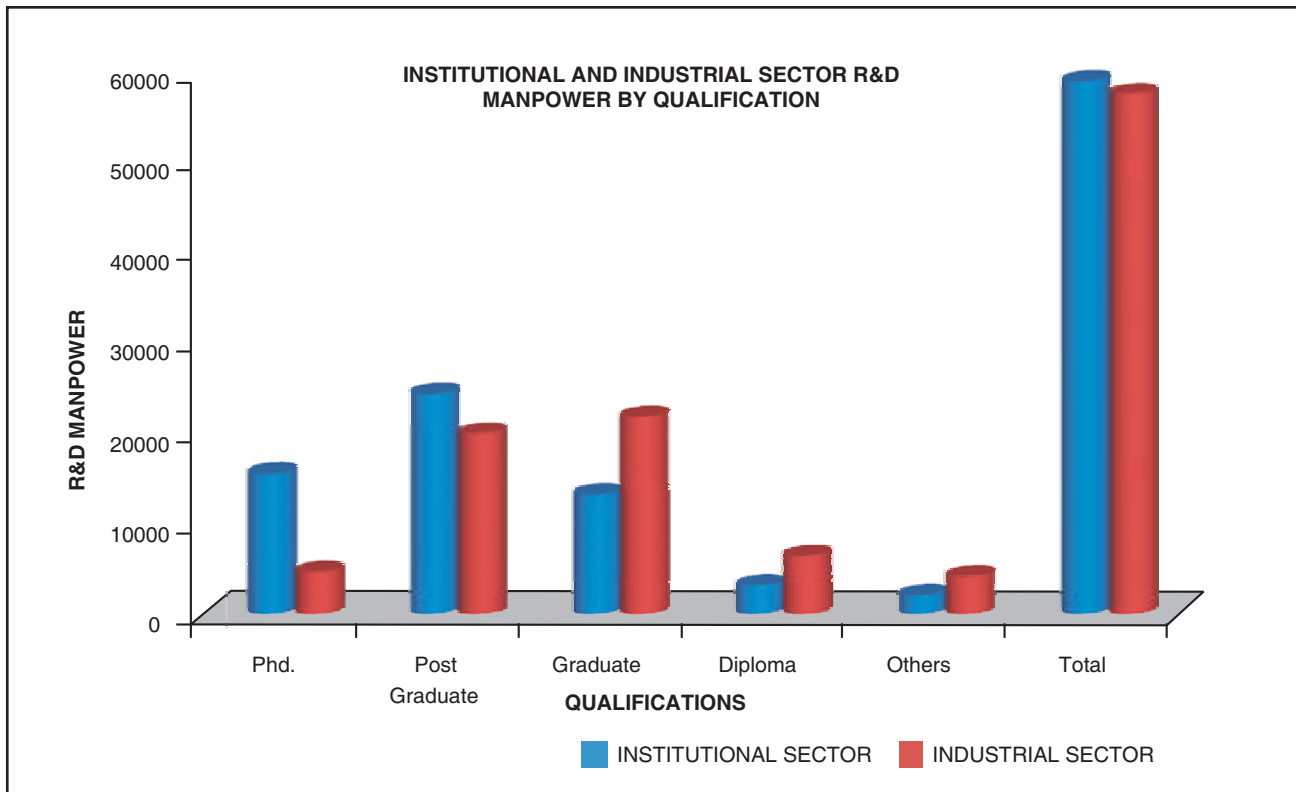
Out of 1,54,827 R&D personnel (personnel primarily engaged in R&D activities), 75,367 (49.0%) were employed in the institutional sector, 22, 100 (14.0%) in higher education sector and the rest 57,360 (37.0%) were employed in the industrial sector as on April 1, 2005. With regard to 1,05,808 auxiliary personnel, the distribution among the institutional and industrial sectors was 83.0% and 17.0% respectively. Out of 1,30,514 personnel extending administrative support, 90.9% belonged to institutional sector and only 9.1% of them were from industrial sector.

In all, there were 61,050 women employed in R&D establishments, which was 15.6% of the total

administrative activities. 78.4% of the total women were employed in the institutional sector. The majority of them were engaged in administrative activities.

An attempt has been made to find out the number of auxiliary and administrative personnel for each R&D person employed for a few selected departments and also for public and private sector industries. This information is given in Table 2.4.

It may be seen from Table 2.4 that the average number of auxiliary personnel per R&D person was 0.79, though it varied from 0.69 to 2.15 in the institutional sector. The figures for public and private sectors industry were 0.41 and 0.29 respectively. The number of administrative personnel per R&D personnel varied from 0.35 to 2.42 in the institutional sector and the same for public and private sector industry was 0.17 and 0.22 respectively. The number of administrative personnel per R&D personnel



Note: Out of 1,54,827 R&D personnel information was available for 1,16,175

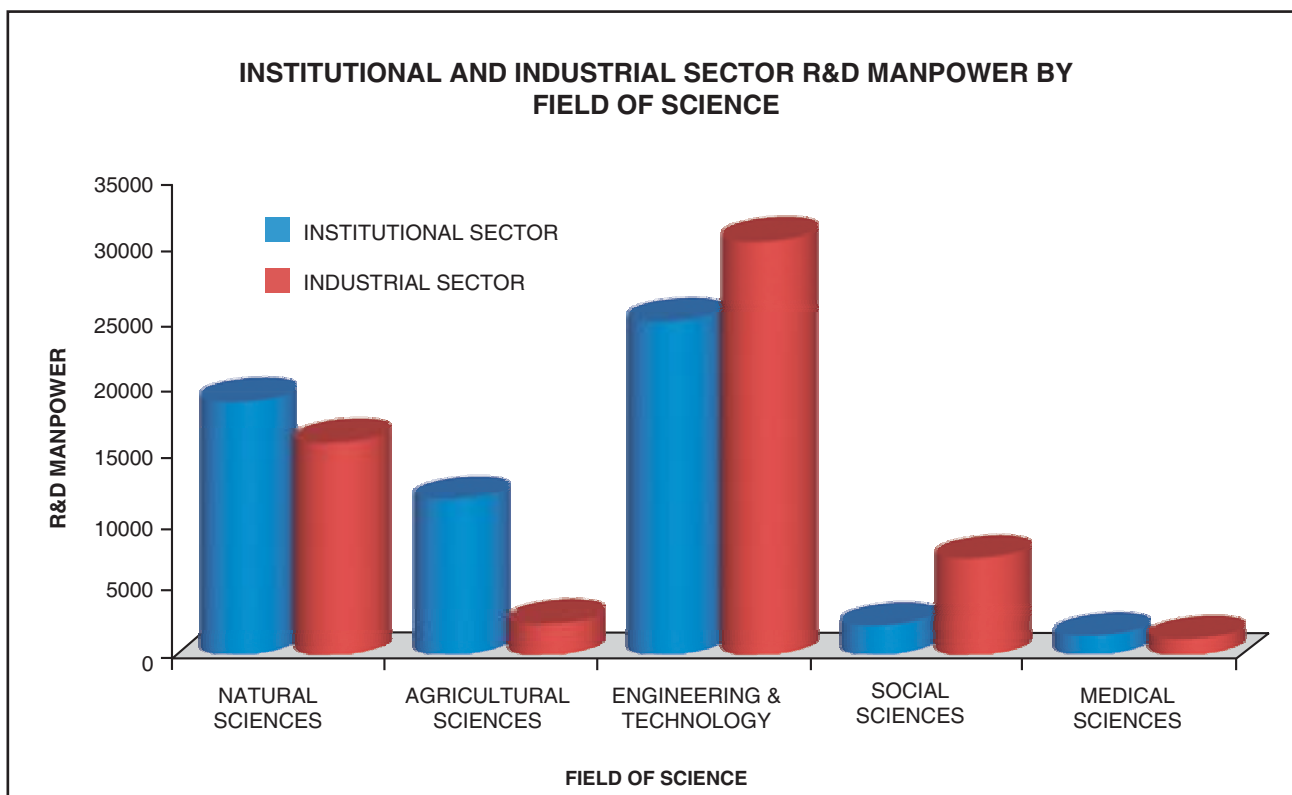
employed in State Governments, Indian Council of Agricultural Research (ICAR) and Indian Council of Medical Research (ICMR) was high when compared to other Organisations/Sectors.

Out of 1,54,827 S&T personnel engaged primarily in R&D activities as on 1st April, 2005, academic qualifications were available in respect of 1,16,175 (75.0%) of S&T personnel engaged in R&D activities. Out of this, 47.6% had engineering and technology background 29.8% had natural sciences; 12.1% had agricultural sciences; 8.1% had medical sciences and rest 2.4% had social sciences background. According to level of qualifications 17.6% were doctorate degree holders; 38.2% were post graduates; 30.3% were graduates; 13.9% were diploma holders and having other qualifications. In natural sciences, 78.2% had post graduation or above qualification, 16.5% had graduate degree and rest 5.3% had other qualifications.

It has been observed that similar trend exists in case of medical and social sciences. In agricultural

sciences 85.7% had post graduates or above qualifications, 7.6% had graduate degree and rest 6.7% had other qualifications. In engineering and technology 30.9% had post graduates and above qualifications, 47.2% had graduate degree, 21.9% had diploma and other qualifications. It may be noted from this analysis that in the field of agricultural sciences, natural sciences, medical sciences and social sciences, there was sizeable proportion of post graduates and doctorates whereas in case of engineering and technology, only 30.9% were post graduates and above and there was sizeable proportion of graduate degree holders (47.2%). Qualification and field of science of R&D personnel when analyzed separately in institutional sector and industrial sector show that the institutional sector employed predominantly doctorates and post graduates while industrial sector employed graduates and diploma holders that too in the field of engineering and technology.

Out of 1,54,827 personnel primarily engaged in R&D activities, 19,707 (12.7%) were females. Field



Note: Out of 1,54,827 R&D personnel information was available for 1,16,175

of specialization and level of qualifications were known for 14,375 (73%) female personnel engaged in R&D activities. About 18.7% of them were Ph.Ds. 39.2% were post graduates, 31.6% were graduates, 10.5% were diploma holders and having other qualifications. By field of science, it was noted that 29.9% were from natural sciences, 39.0% were from engineering and

technology, 14.8% were from medicine, 10.3% were from agricultural sciences while 6.0% were with background in social sciences.

In order to compare the salaries drawn by R&D personnel employed in different sectors, the information regarding annual gross emoluments drawn as per the

**Table 2.5**

**ANNUAL GROSS EMOLUMENTS OF PERSONNEL ENGAGED IN R&D  
IN INSTITUTIONAL, PUBLIC & PRIVATE SECTOR INDUSTRY AS ON 1.4.2005**

(Number)

Annual Gross Emoluments (In Rs. lakhs)	Number of R&D Personnel		
	Institutional Sector	Public Sector Industry	Private Sector Industry
Less than Rs.2.00	7383 (17.0%)	1664 (17.9%)	16105 (33.5%)
Rs.2.00 - 2.99	13933 (32.0%)	2149 (23.2%)	9651 (20.1%)
Rs.3.00 - 3.99	12373 (28.5%)	2407 (25.9%)	8059 (16.8%)
Rs.4.00 - 4.99	7676 (17.7%)	1224 (13.2%)	6912 (14.4%)
Rs. 5.00 and above	2111 (4.9%)	1837 (19.8%)	7372 (15.3%)
<b>Total</b>	<b>43476 (100%)</b>	<b>9281 (100%)</b>	<b>48099 (100%)</b>

Note: Figures in brackets denote percentages.



various salary brackets for institutional, public and private sector industries shown in Table 2.5.

There were 1,54,827 personnel engaged in R&D activities, 75,367 R&D personnel were employed in institutional sector and 57,360 R&D personnel were employed in the industrial sector. Information regarding the annual gross emoluments were available in respect of 1,00,856 out of 1,54,827 R&D personnel employed in all sectors.

It may be noted from table 2.5 that 17.9%, 33.5% of total personnel in public and private sector respectively were getting annual gross emoluments upto Rs. 2,00,000 where as this was only 17.0% in

case of institutional sector. 32.0% of R&D personnel in institutional sector were drawing annual gross emoluments in the range of Rs. 2,00,000 to Rs. 2,99,000 while in public and private sector this percentage was 23.2% and 20.1% respectively.

15.3% of private sector R&D personnel were drawing gross emoluments more than Rs. 5,00,000 and above. This percentage was very low (4.9%) in case of institutional sector. It seems from the data that some of the private industries may not have included the perquisites paid to the employees while giving this information. Therefore, this data should be used as broad indicator.

**To sum up, the salient features are detailed as under :-**

- ❖ As on 1st April, 2005, 3.91 lakhs personnel were employed in R&D establishments.
- ❖ By nature of work, 39.6% were primarily engaged in R&D activities, 27.0% were performing auxiliary activities and 33.4% were providing administrative support.
- ❖ 15.6% of the personnel employed in R&D establishments were women.
- ❖ 12.7% of the total R&D personnel were women.
- ❖ Out of 1,16,175 R&D personnel, the share of R&D personnel with engineering and technology background were 47.5%.
- ❖ 55.8% of total R&D personnel were having postgraduate or above qualifications.
- ❖ Majority (60.5%) of R&D personnel employed in institutional sector were drawing annual gross emoluments between Rs. 2,00,000 - Rs. 3,99,000 whereas this was 49.1% and 36.9% in case of public and private sector industry respectively.
- ❖ Out of 1,54,827 personnel primarily engaged in R&D activities, 75,367 were employed in the institutional sector, 22,100 in higher education sector and the rest 57,360 were employed in the in-house R&D units of public and private sector industries.
- ❖ 57.9% of the total women R&D personnel were having post-graduate and above qualifications.

