

Summary of Important Findings and Recommendations.

A. SUMMARY OF IMPORTANT FINDINGS

1. The total number of Ph.D degrees awarded in Science and Technology during the reference period 1.7.1980 to 30.6.1985, was 18671 averaging 3734 per year.
2. Analysis of responses of 3200 scholars indicates that :
 - * 87.6% were male scholars and 12.4% females,
 - * 33.2% of the scholars were in the age group upto 30 years.,
 - * 45.9% were between 30-39 years, 19.0% between 40-49 years and 1.9% were in the age group 50 years and above,
 - * 95.6% scholars were employed, 4.1% were unemployed and 0.3% were not seeking employment, and
 - * 97.5% of the male scholars were employed. Of the female scholars, 82.1% were employed.
3. Percentage of female scholars (89.9) doing Ph.D at an early age is higher as compared to male scholars (77.6%).
4. Employment percentage of male Ph.Ds in each age group excepting the age group '50 years and above' is higher than that of female Ph.Ds.
5. There is nearly full employment in Technological (excepting Chemical Technology) Agricultural, Medical and Veterinary Sciences. There is full employment in Nuclear Physics, Statistics and Geo-Physics.
6. The lowest percentage employment is in Biochemistry (88.3).
7. Analysis of activities of scholars indicates that :
 - * 38% of the scholars were engaged exclusively in teaching,
 - * 29.4% of the scholars were engaged exclusively in research,
 - * 24.3% of the scholars were engaged both in teaching and research, and
 - * 8.3% of the scholars were engaged in work other than teaching/research e.g. management, administration, quality control, etc.
8. Miscellaneous subjects group (Anthropology, Home Science, Library Science, Meteorology and Oceanography, Demography and Population Studies) has the highest percentage (35.3) and the Technological sciences the lowest percentage (20.7) of scholars engaged exclusively in research work.

9. Physical and Mathematical Sciences group has the highest percentage (45.9) exclusively engaged on teaching while Agriculture, Medical and Veterinary Sciences have the lowest percentage (16.4).
10. Technological Sciences group has the highest percentage (43.0) of scholars engaged both on research and teaching. Physical and Mathematical Sciences have the lowest percentage (15.9).
11. Geo-physics has the highest percentage (57.9) of scholars engaged exclusively on research while Medical Sciences has the lowest (Nil).
12. Medical Sciences has the highest percentage (77.3) engaged exclusively on teaching while Chemical Technology the lowest (12.5).
13. Veterinary Science has the highest percentage (63.0) of scholars engaged both on research and teaching while Biochemistry has the lowest (5.3).
14. Medical Sciences has the highest percentage (22.7) of scholars engaged on work other than research and teaching while Geography has the lowest (3.1%).
15. Analysis of the distribution of scholars by sex indicates that
 - * 36.5% of male scholars are engaged exclusively on teaching as against 51.1% of female scholars,
 - * 29% of male scholars are engaged exclusively on research as against 32.3% of female scholars, and
 - * 26% of male scholars are engaged exclusively on both research and teaching as against 10.5% of female scholars.
16. * Technological Sciences group, Agricultural, Medical and Veterinary Sciences group, and Geo-sciences group are more popular with male scholars as compared to female, the comparative percentages being 10.8, 18.6 and 4.1 for males, and 1.5, 6.5, and 1.5 for females respectively.
 - * Physical Sciences are equally popular both amongst male (39.8%) as well as female scholars (38.8%).
 - * Bio-sciences and Miscellaneous group of sciences are more popular amongst female scholars as compared to males, the comparative percentages being 48.0 and 3.7 for females, and 26.9 and 0.8 for males, respectively.

17. 251 scholars (8.3%) are holding posts in pay scales lower than the entry scale (Rs. 2200-Rs. 4000) for direct recruits in group 'A' organised Services. Their activity wise distribution is - Teaching (73), Research (134) and other (44). Many of these scholars (107) are in the age group 30-39 years and above and have put in 2.5 to 7.5 years of service after award of Ph.D.
18. The percentage of scholars placed - (I) grade (i.e. below Rs. 2200 - Rs. 4000) is far lower in teaching than in research and other professions.
19. Employment opportunities - both quantitative & pay scalewise - are better in teaching institutions as compared to research & other organisations.
20. The employment pattern of Ph.D scholars by type of organisations is as follows:
 - * 70.8% were employed in Universities & other autonomous organisations;
 - * 22.5% were employed in Government departments;
 - * 4.1% were employed in Private Sector Undertakings
 - * 2.4% were employed in Public Sector Undertakings
 - * 0.2% were Self employed.
21. It is observed that except in the case of Medical Sciences, the highest percentage of scholars among all subject groups are employed in the Universities/autonomous organisations.
22. Analysis of length of service put in by scholars indicates that 679 (22.8%) scholars have put in 0-5 years of service, 693 (23.3%) scholars 6-10 years, and 1603 (53.9%) scholars over 10 years of service.
23. Amongst scholars who have put in over 10 years of service 4.1% are in (-) I grade, 37% are in Grade I and 58.9% Grades II and above.
24. Amongst scholars who have put in 0-5 years of service, 16.1% are in (-) I Grade. The corresponding percentage in case of scholars having put in 6-10 years of service is 11.2%.
25. In teaching profession the percentage of scholars in (-) I Grade is the lowest (4.3%) and is highest in Grade I (55.1%).
26. In Teaching Profession :
 - * Chemistry has the highest number of scholars in (-) I Grade.
 - * No Scholars below the age of 30 years had acquired Ph.D in the Technological Sciences, Nuclear Physics, Medical & Veterinary Sciences, Geography, Geophysics and Anthropology.

- * Proportion of scholars holding pay Grade III is the highest in Medical Sciences (47.1%) followed by Electrical Engineering (44.8%), Mechanical Engineering (36.0%).
- * None of the scholars hold pay Grade III in Nuclear Physics, Statistics, Geography, Geophysics and Anthropology.
- * Veterinary, Technological and Medical Sciences have the highest percentage of scholars in Grade II and above while Bio-sciences and Physical and Mathematical sciences have the lowest.

27. In Research Profession :

- * 132 scholars (13.2%) are in (-) I Grade
- * The highest percentage of scholars in (-) I Grade is in Anthropology and the lowest (Nil) in Nuclear Physics, Statistics, Civil Engineering, Electrical Engineering, Electronics & Computer Science and Medical Sciences.
- * No scholar below the age of 30 years acquired Ph.D in Technological Sciences Group, Nuclear Physics, Mathematics, Statistics, Medical Sciences, Veterinary Sciences, Zoology and Anthropology.
- * Technological Sciences Group have the highest percentage (72.0) of scholars holding-Grade II or higher positions while Bio-Sciences have the lowest (33.0).

28. In professions 'other than teaching/research'

- * 19.2% of scholars are in (-) I Grades.
- * Mining, Chemical and Aeronautical Engineering have the highest percentage in (-) I Grade.

29. From career point of view, in all the three professions female scholars are worse off than male scholars.

30. 73.1% of scholars (both male and female) did their Ph.D for their genuine desire for enhancement of knowledge in the relevant subjects, 65.4% for improving their career prospects, 14.9% for getting a particular job in view, 7.5% for having been sponsored by the organisation/employer, 5.5% for meeting the mandatory requirement of the organisation and 7.1% for other miscellaneous reasons.

31. From the point of view of realisation of objectives for which scholars did Ph.D. 63.2% of

scholars are reported to have attained their objectives wholly, 25.1% partially and 11.2% could not achieve their objectives even partially.

32. In Computer Science the percentage of scholars who could attain their purpose fully was maximum (75.8), followed by Chemical Engineering (74.2), Statistics (73.3), Geo-physics (72.2) Nuclear Physics (71.5), Zoology (71.0), Biology (others) (70.9) and Agricultural Sciences (70.3).
33. Realisation of objectives amongst females (58.2%) was lower than that of males (63.9%).
34. Ph.D degree was essential qualification in case of 29.3% of the scholars while it was desirable qualification in case of 41.4% of the scholars. It was neither essential nor desirable in case of 29.3% of the scholars.
35. Medical Sciences, Geology, Botany and Geo-Physics top the subject list where Ph.D is not needed for the position held by the scholars.
36. 57.6% of the scholars were predominantly engaged in the work related to their field of specialisation while 28.6% were engaged in the work which was partly related to their field of specialisation. 13.8% of scholars were engaged in work which was not at all related to their field of specialisation.
37. The highest percentage (71.8%) of scholars engaged in work related to their field of specialisation was in Agriculture, Medical and Veterinary Sciences. The percentages in the other Groups were - Technological Sciences (68.8%), Geo-Sciences (64.9), Bio-Sciences (53.9), and Physical Sciences (50.3).
38. The percentage of female scholars predominantly engaged in work related to their field of specialisation was lower (46.9%) than that of males (58.9%).
39. 48.5% of scholars considered their pay scales to be commensurate with their qualifications and experience. This percentage was the highest (72.2%) in Veterinary Sciences followed by Agriculture Sciences (69.8%), Electronics and Computer Sciences (65.6%) and Medical Sciences (63.6%).
40. Pay scale wise Agriculture, Medical and Veterinary Sciences have the highest percentage of male scholars (63.4) who are satisfied with their grades. The other subject groups in descending order are : Geo-Sciences (51.9%), Technological Sciences (45.9%), Physical Sciences (45.4%), Bio Sciences (44.5%), and the Miscellaneous subjects (Anthropology, Home Science, Library Science etc.) group (34.8%).
41. Technological Sciences have the highest percentage of female scholars who are satisfied

with their grade (80.0%). The other subject groups in descending order are : Miscellaneous subjects Group (66.7%), Agriculture, Medical and Veterinary Sciences (52.4%), Bio Science (45.2%), Physical Sciences (44.4%) and Geo-Science (40.0%).

42. 65.3% of scholars continued their interest in research work even after award of Ph.D. The highest percentage of scholars (74.4%) was in the age group below 30 years. This percentage amongst male scholars was (66.2) and that amongst females (59.0).
43. Biology (others) i.e. Physiology, Genetics, Aquatics, Biology & Life Sciences had the highest percentage of scholars (76.7%) who evinced interest in research even after award of Ph.D. Other subjects in which interest continued was higher than 70% were Nuclear Physics, Statistics, Medical Sciences, Geophysics, Zoology, Bio-Chemistry and Physics.
44. Miscellaneous Group had the lowest percentage of scholars (45.5%) who evinced interest in research after the award of Ph.D. The next lowest was Mathematics followed by Civil Engineering, Veterinary Sciences, Electronics and Computer Science.
45. On an average, each scholar had written 11 papers. This average for males was 12 and that for females 8.
46. On an average each scholar had written 5 papers before and 6 after doing the Ph.D.
47. Average number of papers written per scholar in Medical Sciences was the highest (35 papers) and in Computer Science and Anthropology lowest (7 papers) in each subject.
48. 44% of scholars were not engaged on any project.
49. Out of remaining 56% scholars engaged on projects, each is working on 2 projects.
50. The project data furnished by scholars was analysed in detail for selected subjects. It reveals that :
 - * Maximum percentage of projects (33.8%) are funded by Public Sector organisations.
 - * Minimum percentage of projects (8.3%) are funded by Private Sector.
 - * Govt. Deptts/Ministries including DST has funded 17.4% of the projects.
51. Average duration of project is highest in case of UGC (3.1 years i.e. 37 months) and lowest in case of Public sector organisations (2.0 years i.e. 24 months)
52. Detailed analysis of some subjects, too reveals that each scholar is working on 2 projects.

53. The number of projects decline with increase in the duration of the projects.
54. Only scholars (1.9%) had their patents commercialised. 5 were males and 2 females. The subjects in which more than 5% of the scholars had their patents commercialised were Electronics, Computer Sciences, Geo-physics and Biology (others).
55. In Civil Engineering none of the scholars got his patent commercialised.
56. Of the 3200 scholars who responded, 36 were residing abroad. Of these 32 were in employment or in receipt of fellowship/financial assistance for post doctoral research. The work status of the remaining 4 is not known.
57. Of the 36 scholars abroad 10 were Ph.D in Chemistry, 8 in Biochemistry, 4 in Zoology, 3 each in Physics and Botany, 2 in Chemical Technology and 1 each in Biology (others), Veteniary Science, Civil Engineering, Electrical Engineering, Electronics and Bio Chemical Engineering.
58. Of the 32 scholars employed or getting financial assistance abroad, 18 reported Ph.D as an essential qualification while 3 as a desirable qualification. The remaining 11 reported Ph.D neither essential nor desirable for the positions held by them.
59. Of the 32 scholars employed or getting financial assistance abroad, 2 scholars reported to be doing work unrelated to their fields of specialisation. Both the scholars were Ph.Ds in Chemistry.
60. Most of the scholars residing abroad did their Ph.D to fulfil their desire for genuine knowledge or for improving their career prospects, and 3 scholars out of 34 could attain their objectives.
61. Positions held by 24 scholars abroad were commensurate with their qualifications and experience while the positions of 8 scholars were lower than expected as per their qualifications and experience, 5 of these scholars were Ph.Ds in Chemistry and 3 in Biochemistry.
62. 27 scholars abroad continued to take interest in research work even after award of Ph.D.
63. 3 scholars abroad have had their patents commercialised. 2 of them were Ph.Ds in Biochemistry and 1 in Bio-chemical Engineering. All these three scholars were in age group 30-39 years.

B. RECOMMENDATIONS :

1. The number of Ph.Ds produced in Chemistry, Chemical Technology, Botany, Zoology, Biochemistry and Anthropology appears to be more than what the economy can gainfully absorb. The pace of new induction in these subjects, therefore, needs to be reviewed.
2. Additional intake of Ph.Ds may be considered for subjects having 100% employment (i.e. Engineering, Nuclear Physics, Statistics & Geography).
3. In order that the research organisations can match the teaching institutions in attracting the talent, it seems desirable to improve promotional prospects in research organisations.
4. Considering that a large percentage of scholars (42.4%) are engaged on work wholly or partly unrelated to their field of specialisation, it is suggested that job specifications for various posts may be reviewed so as to match them with job requirements.
5. Female scholars may be given special consideration and better facilities in pursuing Ph.D courses as also in the matter of employment since the number of female Ph.Ds and their percentage of employment is lower than that of male Ph.Ds.