



INTERNATIONAL ATOMIC ENERGY AGENCY



XA9743921

IAEA-CPS-95/19
17 October 1995
Original: ENGLISH

COUNTRY PROGRAMME SUMMARY

**THE AGENCY'S TECHNICAL CO-OPERATION
PROGRAMME WITH
PAKISTAN

1985 - 1995

COUNTRY PROGRAMME SUMMARIES**

DEPARTMENT OF TECHNICAL CO-OPERATION

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PAKISTAN

1985 - 1995

COUNTRY PROGRAMME SUMMARIES

EVALUATION SECTION

DEPARTMENT OF TECHNICAL CO-OPERATION

**THE AGENCY'S TECHNICAL CO-OPERATION
PROGRAMME WITH
PAKISTAN
1985 - 1995
COUNTRY PROGRAMME SUMMARIES**

This report contains a review of the Agency's technical co-operation activities in Pakistan carried out during 1985 - 1995. In terms of coverage and analytical depth, country programme summaries stand somewhere midway between in-depth country programme evaluations and individual project evaluations. They attempt to provide a comprehensive, descriptive picture of the Agency's co-operation with a Member State in a manner that will be particularly useful for programming decisions. The attempt is very much to describe -- largely through statistical data -- not to provide independent analysis and evaluation.

PAKISTAN

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INTRODUCTION

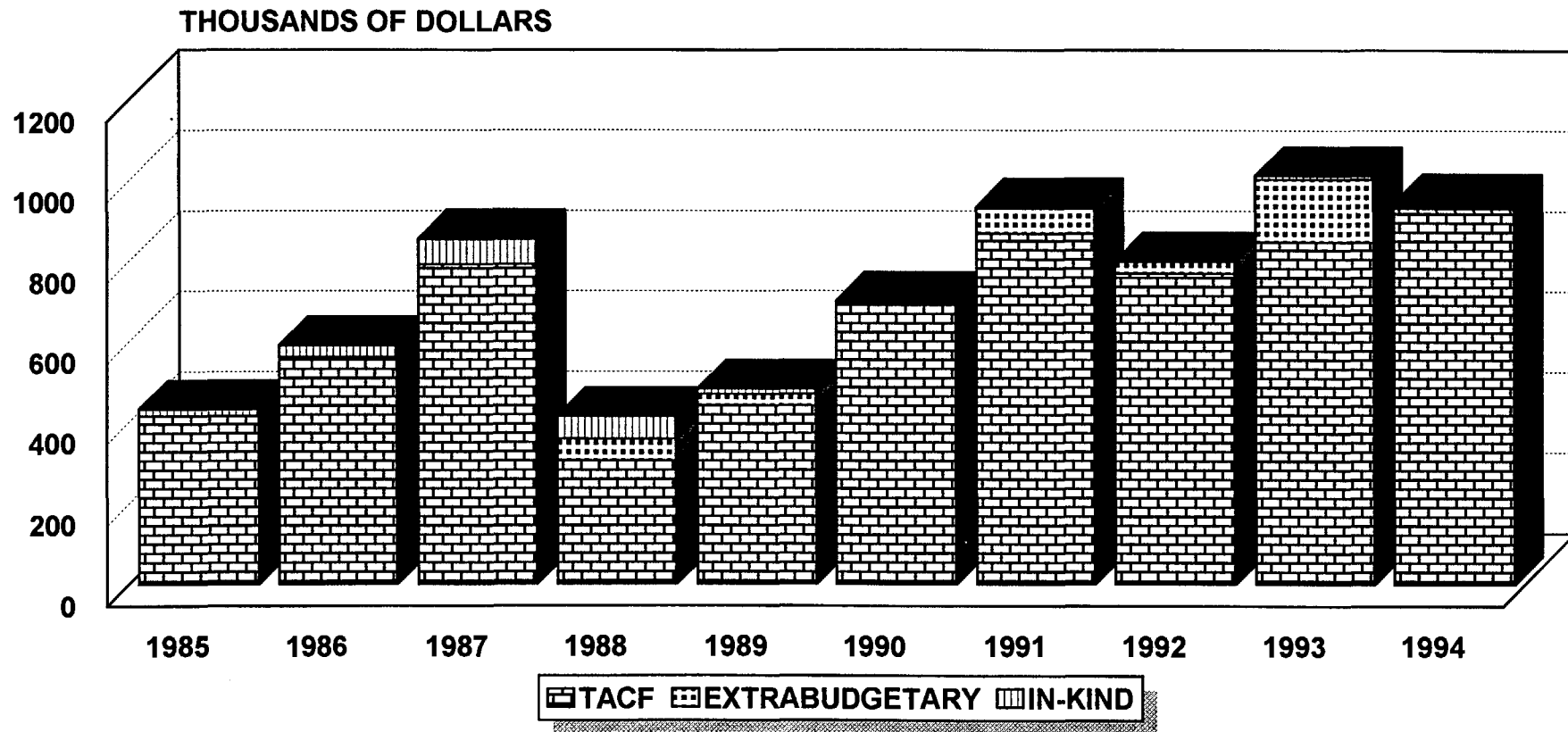
The country programme summary reported on here is one in the series of such studies being undertaken of the Agency's TC programme with Member States. With \$13.6 million of Agency support received, Pakistan ranks 6th among all recipients of technical assistance during the period 1958 through 1994.

The largest share of the assistance received over the past ten years has been provided in the form of equipment (44%), complemented by training (34%) and expert services (22%). The bulk of the resources was made available through the Technical Assistance Fund (92%), the remainder was provided through extrabudgetary contributions (5%) and assistance in kind (3%).

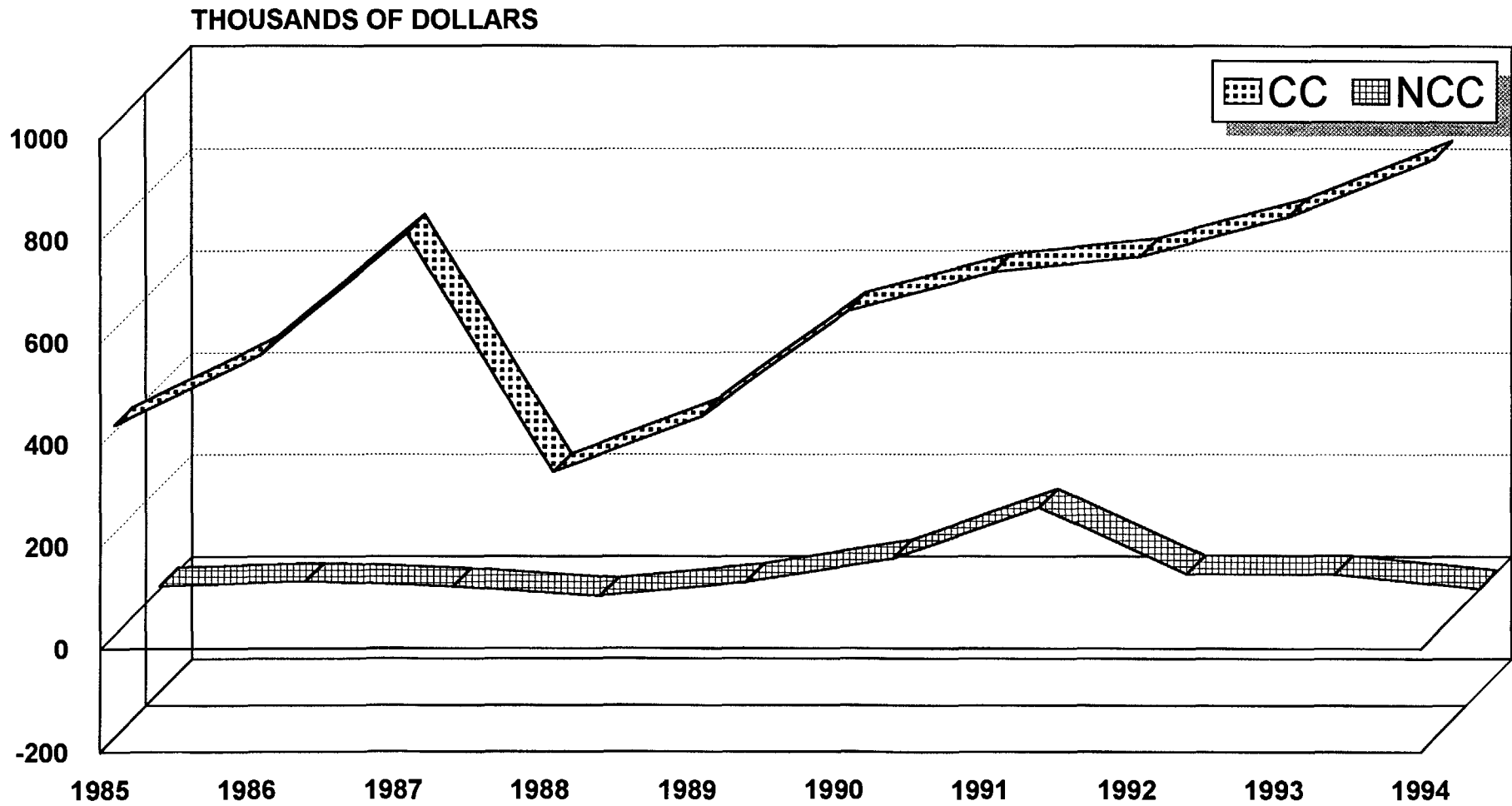
The three major sectors of assistance during the past ten years were nuclear safety (26%), nuclear engineering and technology (19%) and agriculture (15%). Smaller shares went to nuclear physics and chemistry (10%), nuclear medicine and nuclear raw materials (8% each), industry and hydrology and general atomic energy development (7% each).

Since 1985, scientists from Pakistan have completed 194 assignments as Agency experts and training course lecturers or as participants in research co-ordination meetings. During the same period, Pakistan has hosted 54 fellowships and scientific visits, as well as five regional training courses for a total of 60 participants.

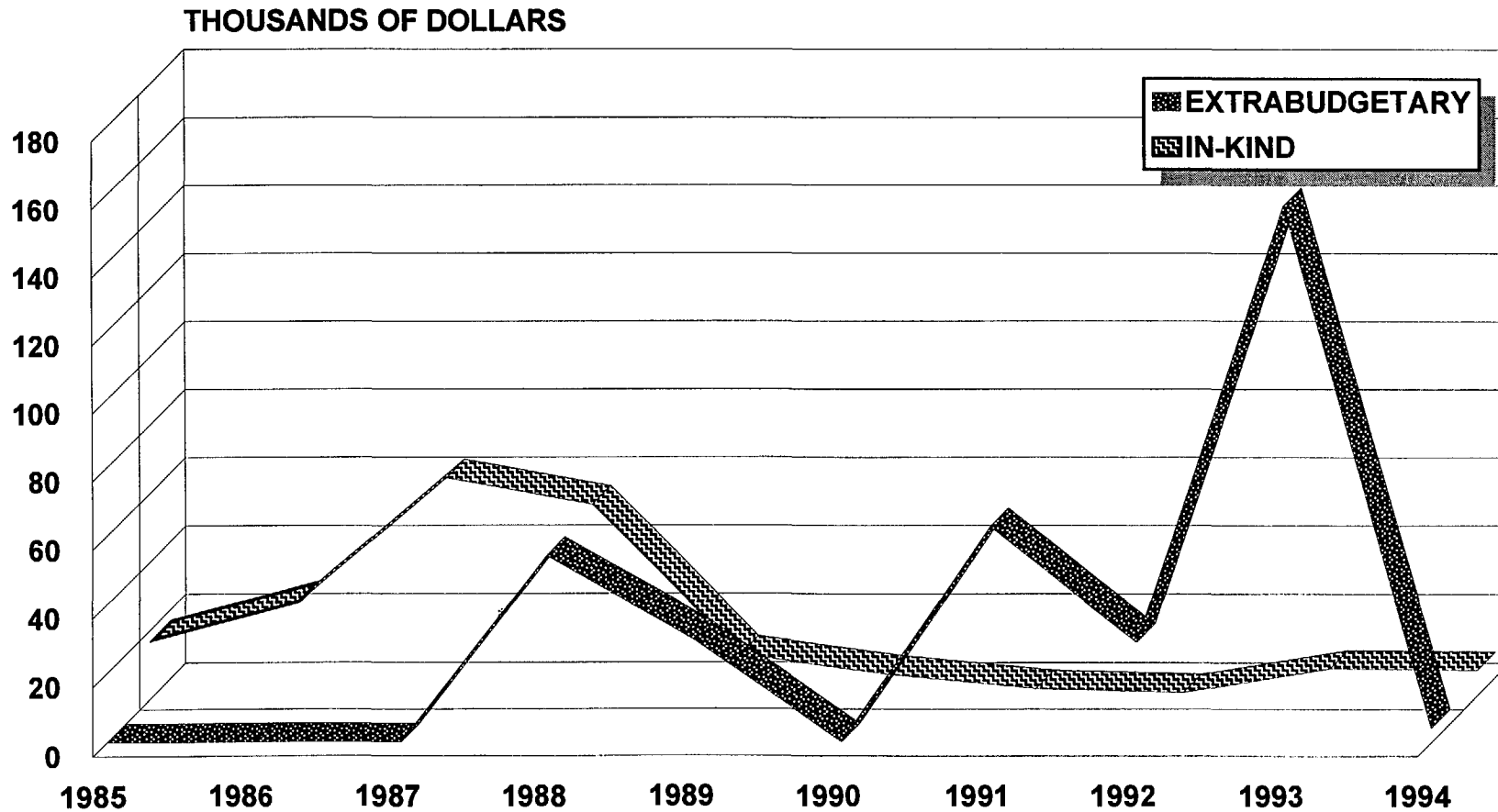
ASSISTANCE PROVIDED BY THE AGENCY TO PAKISTAN BY SOURCE (1985 - 1994)



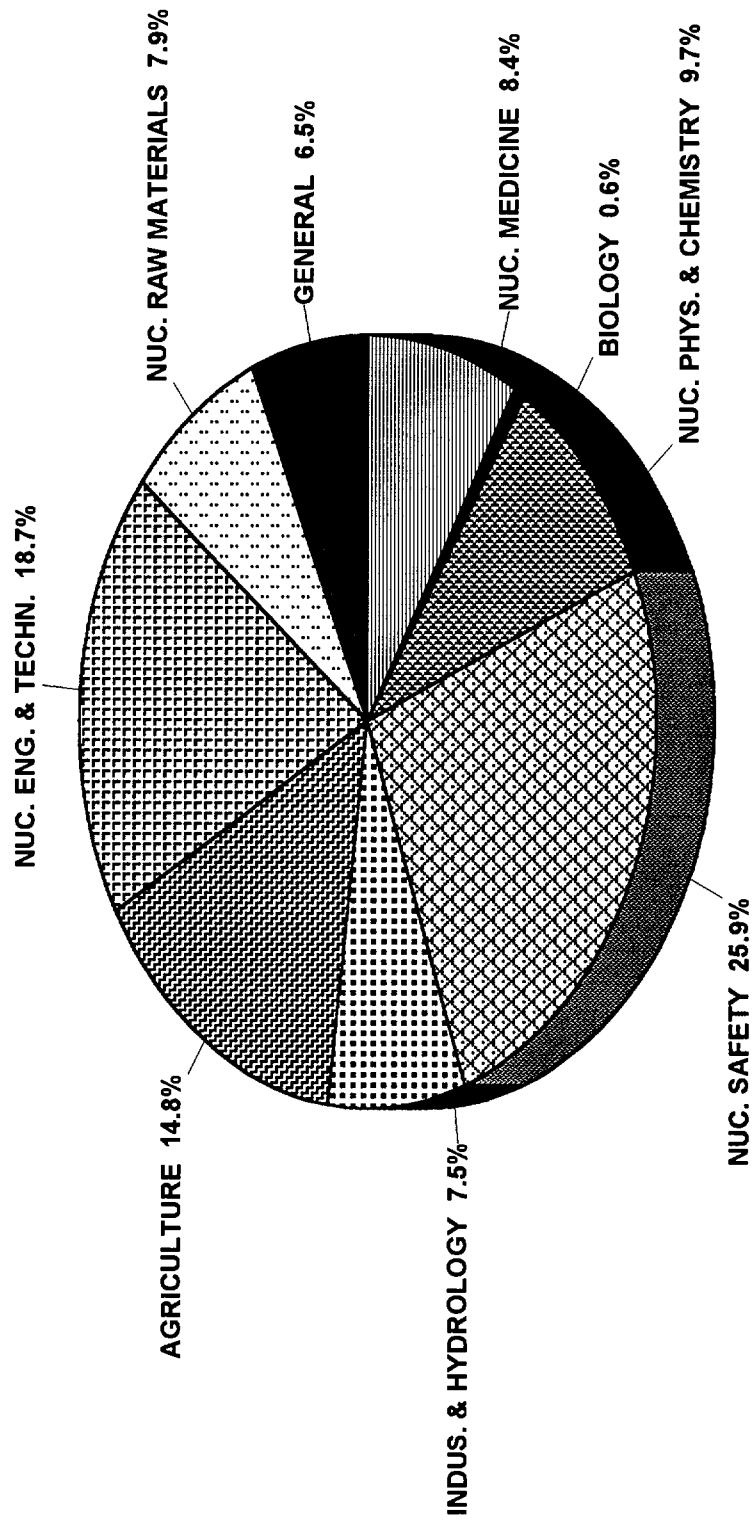
TACF ASSISTANCE PROVIDED TO PAKISTAN (1985 - 1994)



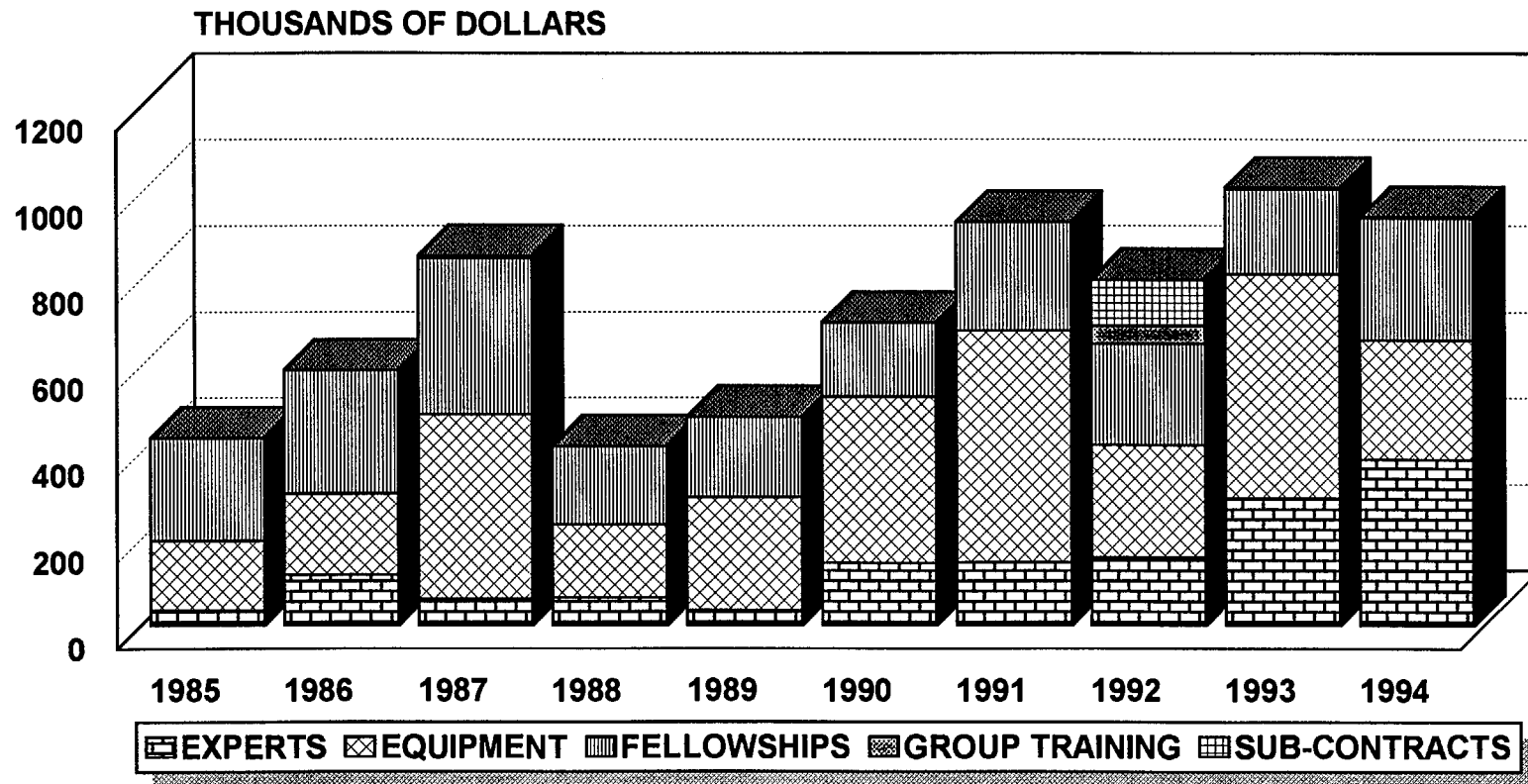
EXTRABUDGETARY AND IN-KIND ASSISTANCE PROVIDED TO PAKISTAN (1985 - 1994)



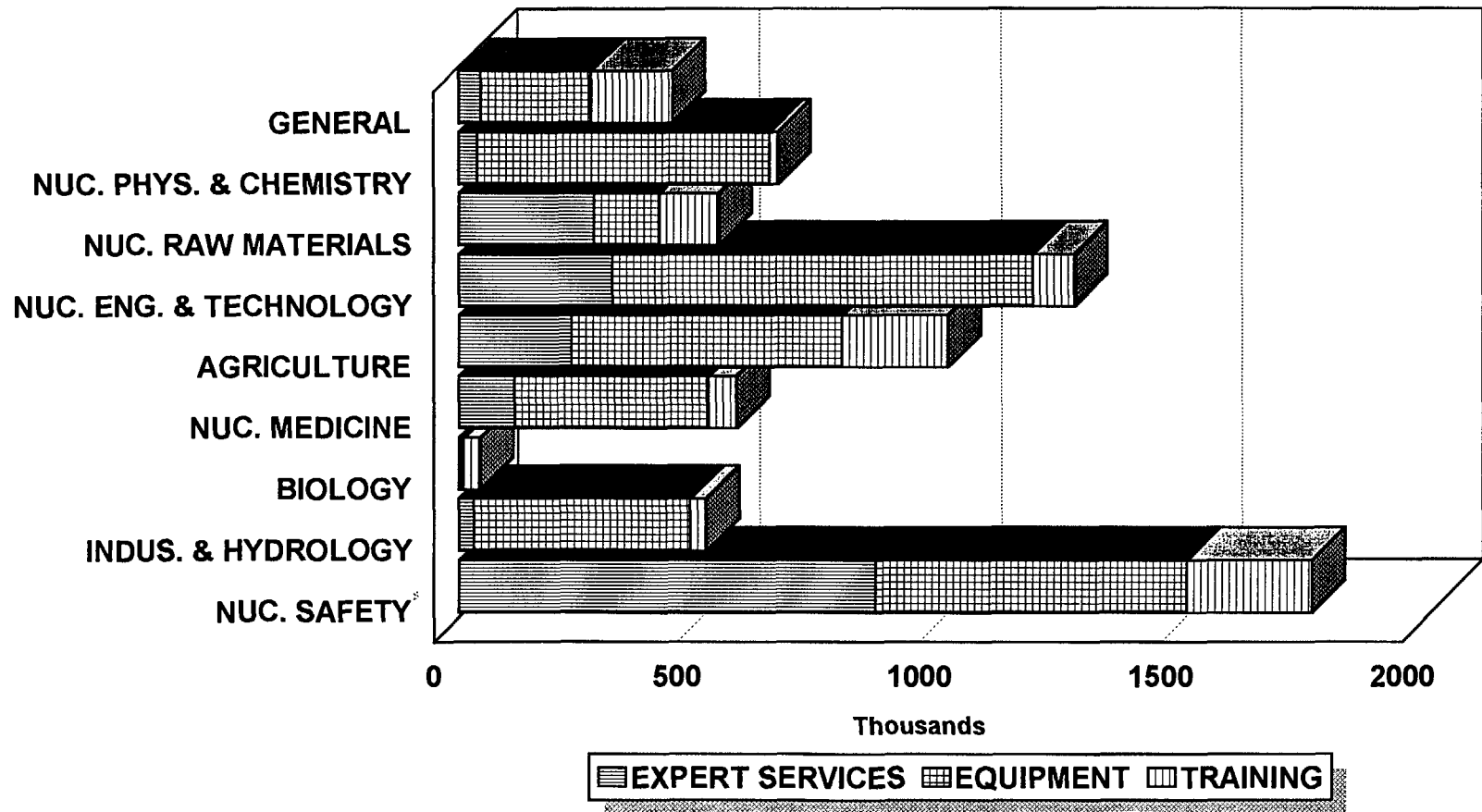
TC PROJECT DISBURSEMENTS IN PAKISTAN BY SECTOR (1985 - 1995)



ASSISTANCE PROVIDED BY THE AGENCY TO PAKISTAN BY TYPE (1985 - 1994)



EXPERT SERVICES, EQUIPMENT AND PROJECT-FUNDED TRAINING PROVIDED TO PAKISTAN BY SECTOR (1985 - 1995)



THE AGENCY'S TECHNICAL CO-OPERATION PROGRAMME WITH PAKISTAN

ALL SOURCES

PAKISTAN'S RANKING AS A TC RECIPIENT
1958 - 1994
(in \$1000)

| YEAR | RANKING | AMOUNT |
|---------|------------------|---------|
| 1958-84 | 6 th | 6445.7 |
| 1985 | 20 th | 431.4 |
| 1986 | 19 th | 589.0 |
| 1987 | 14 th | 855.0 |
| 1988 | 25 th | 412.9 |
| 1989 | 26 th | 481.1 |
| 1990 | 15 th | 699.5 |
| 1991 | 6 th | 933.3 |
| 1992 | 14 th | 799.3 |
| 1993 | 3 rd | 1012.2 |
| 1994 | 11 th | 944.5 |
| 1958-94 | 6 th | 13603.9 |

**"TOP FIVE" RECIPIENTS OF AGENCY ASSISTANCE
1958 - 1994 (in \$1000)**

ALL SOURCES

| Year | I | II | III | IV | V | PAKISTAN |
|---------|-------------|-------------|-------------|-------------|-------------|---------------------------|
| 1958-84 | EGY 10650.4 | BRA 9513.7 | PER 7574.2 | IND 7412.8 | PHI 6679.0 | 6 th - 6445.7 |
| 1985 | EGY 2494.8 | PER 1120.7 | THA 1117.4 | BGD 1068.2 | PHI 963.7 | 20 th - 431.4 |
| 1986 | EGY 2317.0 | BRA 1452.9 | THA 1169.4 | POL 1050.3 | BGD 896.4 | 19 th - 589.0 |
| 1987 | HUN 3452.6 | EGY 1775.4 | THA 1742.4 | INS 1312.5 | YUG 1223.2 | 14 th - 855.0 |
| 1988 | EGY 1486.9 | BUL 1361.6 | CPR 1278.5 | THA 1158.7 | BRA 1096.7 | 25 th - 412.9 |
| 1989 | CPR 1542.3 | EGY 1505.1 | THA 1205.3 | BRA 1096.5 | INS 999.1 | 26 th - 481.1 |
| 1990 | POL 2308.1 | CPR 2005.0 | VIE 1589.2 | INS 1412.6 | BRA 1229.1 | 15 th - 699.5 |
| 1991 | INS 1305.2 | CPR 975.0 | EGY 959.8 | BRA 951.2 | BUL 934.7 | 6 th - 933.3 |
| 1992 | EGY 1586.3 | INS 1342.1 | CPR 1328.8 | MEX 1127.8 | POL 1036.4 | 14 th - 799.3 |
| 1993 | INS 1285.9 | CPR 1091.7 | PAK 1012.2 | EGY 905.3 | IRA 810.1 | 3 rd - 1012.2 |
| 1994 | URT 2153.3 | IRA 1438.5 | CPR 1336.1 | ARG 1225.8 | GHA 1166.9 | 11 th - 944.5 |
| 1958-94 | EGY 25492.2 | BRA 19165.8 | THA 16827.6 | INS 16088.4 | PER 14350.7 | 6 th - 13603.9 |

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**"TOP FIVE" RECIPIENTS OF AGENCY ASSISTANCE
1958 - 1994 (in \$1000)**

TECHNICAL ASSISTANCE AND CO-OPERATION FUND

| Year | I | II | III | IV | V | PAKISTAN |
|---------|-------------|------------|------------|------------|------------|--------------------------|
| 1958-84 | EGY 4652.4 | HUN 3458.4 | PAK 3272.4 | THA 2825.4 | CUB 2761.7 | 3 rd - 3272.4 |
| 1985 | BGD 991.8 | VIE 745.0 | THA 708.7 | BRA 571.8 | POR 538.7 | 13 th - 415.1 |
| 1986 | BRA 1381.8 | THA 871.9 | POL 833.5 | BGD 823.9 | SYR 751.8 | 10 th - 561.7 |
| 1987 | HUN 3305.2 | DRK 986.8 | BUL 888.5 | INS 885.8 | EGY 878.9 | 10 th - 791.6 |
| 1988 | BUL 1195.6 | PER 856.5 | EGY 768.6 | INS 751.7 | MAL 656.0 | 22 nd - 303.2 |
| 1989 | EGY 990.9 | CPR 868.2 | POR 769.6 | CHI 756.9 | MAL 619.4 | 18 th - 439.8 |
| 1990 | POL 1562.3 | VIE 1518.8 | DRK 1156.2 | IRA 958.0 | YUG 933.4 | 11 th - 693.4 |
| 1991 | BUL 893.1 | PAK 868.8 | INS 855.1 | VIE 817.6 | CPR 814.5 | 2 nd - 868.8 |
| 1992 | EGY 1255.7 | CPR 1009.0 | VIE 872.8 | INS 826.6 | IRA 795.5 | 7 th - 769.6 |
| 1993 | INS 1040.5 | CPR 896.5 | PAK 847.6 | IRA 807.4 | THA 721.5 | 3 rd - 847.6 |
| 1994 | URT 1392.9 | IRA 1260.8 | ARG 1206.5 | CPR 1022.8 | PAK 933.0 | 5 th - 933.0 |
| 1958-94 | EGY 12209.1 | PAK 9896.2 | INS 9666.8 | POL 9602.4 | VIE 9566.6 | 2 nd - 9896.2 |

ASSISTANCE PROVIDED BY THE AGENCY TO PAKISTAN

Financial Summary 1985 - 1994
(In thousands of dollars)

| Year | ASSISTANCE PROVIDED, BY TYPE | | | | | | ASSISTANCE PROVIDED, BY SOURCE | | | | | |
|---------|------------------------------|-----------|-------------|----------------|---------------|---------|--------------------------------|---------|----------|-----------------|---------|---------|
| | Experts | Equipment | Fellowships | Group training | Sub-contracts | Total | UNDP | TACF CC | TACF NCC | Extra-budgetary | In-kind | Total |
| 1985 | 34.2 | 160.9 | 236.3 | - | - | 431.4 | - | 409.8 | 5.3 | - | 16.3 | 431.4 |
| 1986 | 116.4 | 187.2 | 285.4 | - | - | 589.0 | - | 547.6 | 14.1 | - | 27.3 | 589.0 |
| 1987 | 59.5 | 426.8 | 363.5 | - | 5.2 | 855.0 | - | 787.9 | 3.7 | - | 63.4 | 855.0 |
| 1988 | 63.1 | 167.8 | 182.0 | - | - | 412.9 | - | 318.1 | (14.9) | 54.1 | 55.6 | 412.9 |
| 1989 | 34.2 | 260.3 | 186.6 | - | - | 481.1 | - | 427.0 | 12.8 | 29.5 | 11.8 | 481.1 |
| 1990 | 142.2 | 385.3 | 172.0 | - | - | 699.5 | - | 634.5 | 58.9 | - | 6.1 | 699.5 |
| 1991 | 144.8 | 536.6 | 251.9 | - | - | 933.3 | - | 710.1 | 158.7 | 62.6 | 1.9 | 933.3 |
| 1992 | 156.1 | 259.9 | 234.1 | 42.4 | 106.8 | 799.3 | - | 740.9 | 28.7 | 28.9 | 0.8 | 799.3 |
| 1993 | 291.9 | 519.8 | 197.9 | 2.6 | - | 1 012.2 | - | 819.2 | 28.4 | 156.9 | 7.7 | 1 012.2 |
| 1994 | 382.4 | 276.5 | 283.6 | 2.0 | - | 944.5 | - | 933.0 | - | 4.1 | 7.4 | 944.5 |
| 1985-94 | 1 424.8 | 3 181.1 | 2 393.3 | 47.0 | 112.0 | 7 158.2 | - | 6 328.1 | 295.7 | 336.1 | 198.3 | 7 158.2 |

TECHNICAL CO-OPERATION PROJECTS IN PAKISTAN
BY SECTOR

PROJECTS COMPLETED AND OPERATIONAL 1985 - 1995

TOTAL PROJECT ALLOTMENTS AND DISBURSEMENTS
(As of 30 September 1995)

| SECTOR | NO. OF PROJECTS | ALLOTMENTS \$ | % OF TOTAL | DISBURSEMENTS \$ | % OF TOTAL |
|--|-----------------|---------------|------------|------------------|------------|
| General atomic energy development | 5 | 860 601 | 10.2 | 441 370 | 6.5 |
| Nuclear physics and chemistry | 4 | 716 032 | 8.5 | 657 659 | 9.7 |
| Nuclear raw materials | 2 | 505 005 | 6.0 | 535 814 | 7.9 |
| Nuclear engineering and technology | 14 | 1 505 425 | 17.9 | 1 271 144 | 18.7 |
| Nuclear techniques in agriculture | 14 | 1 322 573 | 15.7 | 1 009 546 | 14.8 |
| Nuclear medicine | 5 | 567 638 | 6.8 | 573 073 | 8.4 |
| Nuclear techniques in biology | 1 | 55 868 | 0.7 | 42 721 | 0.6 |
| Nuclear techniques in industry and hydrology | 6 | 601 953 | 7.2 | 510 024 | 7.5 |
| Nuclear safety | 15 | 2 273 649 | 27.0 | 1 761 334 | 25.9 |
| TOTAL | 66 | 8 408 744 | 100.0 | 6 802 685 | 100.0 |

TECHNICAL CO-OPERATION PROJECTS IN PAKISTAN
 COMPLETED AND OPERATIONAL, BY SECTOR, 1985 - 1995
 (As of 30 September 1995)

| Sector | No. of projects | Total project allotments \$ | Total project disbursements \$ |
|--|-----------------|-----------------------------|--------------------------------|
| <u>Completed projects</u> | | | |
| General atomic energy development | 2 | 239 078 | 241 661 |
| Nuclear physics and chemistry | 2 | 493 661 | 487 040 |
| Nuclear raw materials | 1 | 124 770 | 171 509 |
| Nuclear engineering and technology | 10 | 837 052 | 876 724 |
| Nuclear techniques in agriculture | 6 | 540 081 | 550 987 |
| Nuclear medicine | 5 | 567 638 | 573 073 |
| Nuclear techniques in biology | - | - | - |
| Nuclear techniques in industry & hydrology | 4 | 279 075 | 287 279 |
| Nuclear safety | 7 | 537 045 | 506 312 |
| TOTAL | 37 | 3 618 400 | 3 694 585 |
| <u>Operational projects</u> | | | |
| General atomic energy development | 3 | 621 523 | 199 709 |
| Nuclear physics and chemistry | 2 | 222 371 | 170 619 |
| Nuclear raw materials | 1 | 380 235 | 364 305 |
| Nuclear engineering and technology | 4 | 668 373 | 394 420 |
| Nuclear techniques in agriculture | 8 | 782 492 | 458 559 |
| Nuclear medicine | - | - | - |
| Nuclear techniques in biology | 1 | 55 868 | 42 721 |
| Nuclear techniques in industry & hydrology | 2 | 322 878 | 222 745 |
| Nuclear safety | 8 | 1 736 604 | 1 255 022 |
| TOTAL | 29 | 4 790 344 | 3 108 100 |

**EXPERT SERVICES, EQUIPMENT AND PROJECT-FUNDED TRAINING PROVIDED TO PAKISTAN, BY SECTOR
PROJECTS COMPLETED AND OPERATIONAL 1985 - 1995
(As of 30 September 1995)**

| FIELD | TOTAL PROJECT ALLOTMENTS | | | | TOTAL PROJECT DISBURSEMENTS | | | |
|--|--------------------------|------------------|------------------|------------------|-----------------------------|------------------|------------------|----------------|
| | EXPERT SERVICES | | EQUIPMENT | TRAINING | EXPERT SERVICES | | EQUIPMENT | TRAINING |
| | M/M | \$ | \$ | \$ | M/M | \$ | \$ | \$ |
| General atomic energy development | 9/23 | 111 180 | 227 198 | 522 223 | 3/13 | 43 900 | 227 198 | 170 272 |
| Nuclear physics and chemistry | 7/27 | 47 315 | 650 917 | 17 800 | 7/14 | 36 725 | 603 256 | 17 678 |
| Nuclear raw materials | 35/02 | 237 620 | 139 943 | 127 442 | 34/07 | 277 756 | 135 912 | 122 146 |
| Nuclear engineering and technology | 35/02 | 332 190 | 1 023 773 | 149 462 | 27/05 | 315 024 | 868 964 | 87 156 |
| Nuclear techniques in agriculture | 31/26 | 298 055 | 677 584 | 346 934 | 21/25 | 231 241 | 559 343 | 218 962 |
| Nuclear medicine | 15/07 | 106 201 | 403 147 | 58 290 | 15/19 | 113 802 | 402 881 | 56 390 |
| Nuclear techniques in biology | 1/00 | 9 300 | 4 600 | 41 968 | 0/28 | 4 190 | 4 483 | 34 048 |
| Nuclear techniques in industry & hydrology | 4/12 | 44 285 | 509 316 | 48 352 | 2/21 | 29 745 | 447 949 | 32 330 |
| Nuclear safety | 82/14 | 1 018 733 | 718 830 | 536 086 | 60/27 | 858 863 | 645 455 | 257 016 |
| TOTAL | 222/23 | 2 204 879 | 4 355 308 | 1 848 557 | 174/09 | 1 911 246 | 3 895 441 | 995 998 |

AGENCY FELLOWS FROM PAKISTAN

1985 - 1995 ^{1/}
(As of 30 September 1995)

| Sector | No. of fellowships | No. of months/days | Host countries |
|--|--------------------|--------------------|---|
| General atomic energy development | 14 | 45/03 | ARG, HUN, SWE, SPA, RUS, FRA, UK, IAEA |
| Nuclear physics | 3 | 14/12 | ARG, AUS, UK, IAEA |
| Nuclear chemistry | 16 | 83/29 | GER, NOR, SWE, AUS, GRE, CZE, CPR, CHI, CAN, USSR, IAEA |
| Nuclear raw materials | 19 | 43/21 | CPR, ARG, CAN, BUL, NER, CZE, ROM |
| Nuclear engineering and technology | 52 | 316/13 | GER, ARG, AUS, BEL, FRA, ITA, SWE, GDR, CAN, RUS, SPA, CZE, CZR, CPR, HUN, ROK, UK, CEC, IAEA, |
| Nuclear techniques in agriculture | 56 | 234/02 | USA, GER, AUL, JPN, GRE, MEX, GUA, PHI, CPR, ITA, CAN, HUN, NET, ROK, INS, BEL, RUS, FIJ, SUD, EGY, POL, THA, SPA, UK, IAEA |
| Nuclear medicine | 21 | 141/13 | USA, INS, GER, AUL, SWE, UK |
| Nuclear techniques in biology | 3 | 12/00 | UK |
| Nuclear techniques in industry and hydrology | 14 | 70/05 | ITA, GER, AUS, FRA, AUL, JPN, CPR, ROK, INS, UK, IAEA |
| Nuclear safety | 55 | 167/25 | HUN, GER, FRA, AUS, FIN, SWE, ITA, ROK, NET, IRE, YUG, CAN, CPR, ROM, CZE, ARG, RUS, INS, EGY, TUR, CZR, BUL, UK, CEC, IAEA |
| TOTAL | 253 | 1129/03 | |

^{1/} Awarded since 1985, but only includes fellows who have completed or at least started training.

PAKISTAN
LONG-TERM FELLOWSHIPS
1985 - 1995
(As of 30 September 1995)

| Name | Field of study | Host country | Date | Duration | Project |
|----------------|--------------------------------------|--------------|-----------------|----------|-----------|
| BHATTI, A.R. | Library science 0F | UK | Sep.87 - Mar.89 | 18/08 | PAK/0/003 |
| MUMTAZ | Economic aspects of atomic energy 0E | UK | Sep.90 - Sep.91 | 12/00 | RAS/0/014 |
| MAHMOOD | Physical chemistry 2E | SWE | May 86 - Nov.87 | 18/00 | - |
| MANNAN | Analytical chemistry 2C | GER | Apr.86 - Jul.87 | 15/00 | - |
| MARDAN | Physical chemistry 2E | NOR | Jul87 - Mar.89 | 18/00 | - |
| ABDUL REHMAN | Research reactor instrumentation 4G | UK | Apr.85 - Sep.86 | 17/17 | - |
| AHMAD, MAQSOOD | Irradiation effects 4K | GER | Sep.87 - Sep.88 | 12/01 | - |
| AHMAD, S. | Stress analysis 4A | GER | Sep.85 - Sep.87 | 24/00 | - |
| AHMED, Z. | Computer engineering 4G | ITA | Feb.87 - Aug.88 | 17/27 | PAK/0/003 |
| AYAZUDDIN | NPP instrumentation and control 4G | FRA | Jan.86 - Apr.87 | 15/00 | PAK/4/024 |
| BHATTI, Z.H. | Post-irradiation fuel examination 4E | ARG | Apr.87 - Jul.88 | 15/01 | - |
| ISRAR | Reactor operation and maintenance 4B | AUS | Nov.86 - Nov.87 | 12/00 | - |

PAKISTAN
LONG-TERM FELLOWSHIPS
1985 - 1995
(As of 30 September 1995)

| Name | Field of study | | Host country | Date | Duration | Project |
|---------------|--|----|--------------|-----------------|----------|-----------|
| KHAN, L.A. | Low enriched fuel for research reactors | 4B | GER | Jul.86 - Jul.87 | 12/00 | - |
| MAJEED, AZHAR | Nuclear instrumentation | 4G | CEC | Sep.91 - Sep.92 | 12/00 | RAS/0/018 |
| NIAZI | Nuclear instrumentation, electronics and reactor control | 4G | CEC | Sep.91 - Sep.92 | 12/00 | RAS/0/018 |
| QAZI, M.K. | Reactor technology | 4D | ARG | Feb.92 - Feb.93 | 12/00 | PAK/4/030 |
| RABBANI | Electronic control and instrumentation | 4G | ITA | Oct.84 - Apr.86 | 18/00 | - |
| RIAZ | Nuclear electronics | 4G | UK | Oct.84 - Mar.86 | 17/15 | - |
| RIAZ AHMAD | NPP instrumentation and control | 4G | FRA | Nov.84 - Mar.86 | 16/23 | - |
| SHAMSUL | Nuclear instrumentation | 4G | FRA | Dec.84 - Jul.86 | 18/00 | - |
| SYED, H.M. | Nuclear power reactor fuel management | 4D | GER | Apr.84 - Sep.85 | 18/00 | - |
| UR RAHMAN, S. | Reactor technology | 4D | CZR | Started: Oct.92 | 12/00 | PAK/4/037 |
| AKHTER | Soil physics | 5B | AUL | Feb.90 - Feb.91 | 12/00 | RAS/0/014 |
| ALTAF | Plant breeding | 5C | UK | Aug.87 - Jul.89 | 14/00 | RAS/5/015 |

PAKISTAN
LONG-TERM FELLOWSHIPS
1985 - 1995
(As of 30 September 1995)

| Name | Field of study | | Host country | Date | Duration | Project |
|-----------------|--|----|--------------|-----------------|----------|-----------|
| ASLAM, MUHAMMAD | Plant breeding | 5C | USA | Aug.85 - Feb.87 | 18/00 | - |
| HUSSAIN, F. | Soil fertility | 5B | USA | May 85 - May 86 | 12/00 | - |
| KANDHRO | Plant breeding | 5C | RUS | Apr.91 - Apr.92 | 12/00 | RAS/0/018 |
| KHAN, A.J. | Mutation breeding of wheat | 5C | POL | Jan.90 - Dec.90 | 12/00 | RAS/0/014 |
| KHAN, IMTIAZ | Plant breeding and genetics | 5C | POL | Feb.92 - Feb.93 | 12/00 | RAS/0/018 |
| KHATTAK, A.B. | Cereal grain quality | 5C | USA | Jun.87 - Jun.88 | 12/00 | - |
| MAHMOOD, K. | Soil science and agriculture nutrition | 5B | BEL | Nov.90 - Jan.92 | 14/00 | PAK/5/022 |
| SHAH, S.M. | Plant nutrition | 5B | AUL | Aug.86 - Aug.87 | 12/00 | PAK/5/017 |
| HYDER | Nuclear medicine | 6B | UK | Jul.86 - Oct.87 | 15/00 | PAK/6/007 |
| JAFRI | Nuclear medicine | 6B | UK | Sep.85 - Jan.87 | 16/00 | - |
| KHAN, A. | Nuclear medicine | 6B | USA | Jul.87 - Jun.88 | 12/00 | - |
| MEMON | Nuclear medicine | 6B | UK | Jun.86 - Oct.87 | 16/12 | PAK/6/009 |

PAKISTAN
LONG-TERM FELLOWSHIPS
1985 - 1995
(As of 30 September 1995)

| Name | Field of study | | Host country | Date | Duration | Project |
|-----------------|---------------------------|----|--------------|-----------------|----------|-----------|
| NAEEM, MUHAMMAD | Nuclear medicine | 6B | UK | Jun.88 - Dec.89 | 18/00 | - |
| MANSUR ALAM | Non-destructive testing | 8C | ITA | Feb.86 - Apr.87 | 13/25 | - |
| ARIF | Radiation protection | 9C | HUN | Oct.87 - Sep.88 | 12/00 | - |
| KHAN, M.N. | Personal dosimetry | 9C | UK | Aug.88 - Dec.89 | 16/00 | - |
| MULLA | Safety evaluation of NPPs | 9F | ITA | Mar.85 - Sep.86 | 18/00 | - |
| NASIM, B. | Safety evaluation | 9F | CEC | Sep.92 - Oct.93 | 12/15 | RAS/0/016 |

**PAKISTANI NATIONALS WHO WERE AWARDED MORE THAN ONE
FELLOWSHIP OR SCIENTIFIC VISIT
1985 - 1995
(As of 30 September 1995)**

| Name | Field of study | Host country | Date | Duration | Project |
|--------------|--|--------------|--------------------|----------|------------------------|
| ABDUL REHMAN | 1. Research reactor instrumentation | 4G | UK ITA | 17/17 | - |
| | 2. Radiation protection | 9C | | 4/00 | |
| AKRAM, W. | 1. Isotope hydrology | 8O | IAEA AUL | 3/07 | RAS/0/014 PAK/0/007 |
| | 2. Ground water hydrology | 8N | | 3/00 | |
| AMANAT | 1. Radiation protection | 9C | AUS UK | 6/06 | PAK/9/007 PAK/1/022 |
| | 2. Dosimetry | 1K | | 6/11 | |
| ARAIN | 1. Plant breeding | 5C | CPR/SUD/EGY AUL | 0/19 | RAS/0/014 PAK/5/030 |
| | 2. Plant breeding | 5C | | 0/26 | |
| AZHAR | 1. Nuclear instrumentation, electronics and reactor | 4G | IAEA BUL | 6/00 | RAS/0/018 PAK/0/005 |
| | 2. Safety evaluation | 9F | | 0/07 | |
| CHEEMA | 1. Radioanalytical chemistry | 2A | GER USSR | 0/12 | - |
| | 2. Analytical chemistry | 2C | | 0/07 | |
| HASAN | 1. NPP operational safety | 9F | FRA ITA | 0/16 | - |
| | 2. Safety of reactors and nuclear materials | 9D | | 0/12 | |
| HUSAIN, W. | 1. Safety evaluation | 9F | ROK ROK | 0/19 | RAS/0/014 PAK/9/010 |
| | 2. Nuclear chemical engineering | 4F | | 3/00 | |

**PAKISTANI NATIONALS WHO WERE AWARDED MORE THAN ONE
FELLOWSHIP OR SCIENTIFIC VISIT
1985 - 1995
(As of 30 September 1995)**

| Name | Field of study | Host country | Date | Duration | Project |
|----------------|--|--|------------------------------------|---------------|------------------------|
| HUSSAIN, A.C. | 1. Agricultural biochemistry 2. Agricultural biochemistry | 5G 5G USA/CAN USA | Aug.87 - Sep.87 Mar.94 | 0/19 0/21 | - PAK/5/029 |
| JEHANGIR | 1. Radiopharmacy 2. Production and control of radiopharmaceuticals | 6G 2G USA/JPN GRE | Jul.84 - Jul.85 Oct.90 - Jan.91 | 11/26 3/00 | - PAK/6/012 |
| KARIM, H.M.A. | 1. Radiopharmacy 2. Production of isotopes | 6G 4H INS GDR | Feb.88 - Mar.88 Nov.89 | 0/26 1/00 | - RAS/0/014 |
| KHAN, R.M.S.I. | 1. Plant breeding 2. Plant breeding and genetics | 5C 5C USA USA | Aug.86 Sep.95 | 0/16 0/14 | - PAK/5/033 |
| MAHMOOD, H. | 1. Safety of reactors and nuclear materials 2. Safety evaluation | 9D 9F ITA BUL | Jan.94 - Feb.94 Oct.94 | 1/00 0/07 | RAS/0/018 PAK/0/005 |
| MANSUR ALAM | 1. Non-destructive testing 2. Safety evaluation | 8C 9D ITA CAN | Feb.86 - Apr.87 Jul.93 - Sep.93 | 13/25 2/00 | - PAK/9/010 |
| MIRZA, K.F. | 1. Safety evaluation 2. Radiation protection | 9F 9C UK CAN | Mar.87 - Apr.87 Mar.92 | 0/19 0/26 | - PAK/9/010 |
| MUMTAZ | 1. Economic aspects of atomic energy 2. Economic aspects of atomic energy | 0E 0E UK IAEA | Sep.90 - Sep.91 May 94 - Jun.94 | 12/00 0/09 | RAS/0/014 PAK/0/005 |
| QURESHI, Z.A. | 1. Sterile insect technique 2. Entomology | 5D 5D GRE/USA/ MEX/GUA USA | Sep.86 - Oct.86 May 94 - Jun.94 | 1/10 0/24 | PAK/5/018 PAK/5/027 |

**PAKISTANI NATIONALS WHO WERE AWARDED MORE THAN ONE
FELLOWSHIP OR SCIENTIFIC VISIT
1985 - 1995
(As of 30 September 1995)**

| Name | Field of study | Host country | Date | Duration | Project | |
|----------------|---|--------------|-------------|-----------------|---------|-----------|
| RAHMAN, M.S. | 1. Safety evaluation | 9F | UK | Jul.89 | 0/19 | RAS/0/014 |
| | 2. Safety of reactors and nuclear materials | 9D | IAEA | Mar.94 - May 94 | 2/00 | PAK/9/014 |
| RAJPUT, M.A. | 1. Plant breeding | 5C | IAEA/USA | Jul.86 | 0/18 | RAS/5/015 |
| | 2. Mutation breeding | 5C | CPR/ROK/INS | Oct.87 - Nov.87 | 0/20 | RAS/5/015 |
| | 3. Plant breeding and genetics | 5C | ROK/THA/EGY | Jul.91 | 0/19 | RAS/0/018 |
| SALIHAI | 1. Food irradiation | 5H | CAN/USA | Nov.89 - Dec.89 | 0/19 | RAS/0/014 |
| | 2. Entomology | 5D | AUL | Oct.93 - Nov.93 | 0/14 | PAK/5/028 |
| SATTAR | 1. Food irradiation | 5H | GER | Sep.85 - Nov.85 | 2/00 | PAK/5/019 |
| | 2. Entomology | 5D | USA | May 94 - Dec.94 | 6/29 | PAK/5/028 |
| SHAHID, K.A. | 1. Corrosion of nuclear materials | 4E | GER | Oct.85 - Apr.86 | 6/00 | - |
| | 2. Reactor technology | 4D | CZE | Apr.92 | 0/12 | PAK/4/037 |
| SIDDIQUI, S.H. | 1. Plant breeding | 5C | AUL/USA/JPN | Jan.85 - Feb.85 | 0/20 | - |
| | 2. Plant breeding | 5C | AUL/FIJ/USA | Nov.89 - Dec.89 | 1/10 | RAS/0/014 |
| TARIQ, M. | 1. Non-destructive testing techniques | 8C | UK | Aug.87 - Apr.88 | 8/00 | - |
| | 2. Nuclear instrumentation, electronics and reactor control | 4G | IAEA | Apr.94 - Oct.94 | 6/00 | RAS/8/018 |
| ZAHEER | 1. Nuclear medicine | 6B | UK | Apr.85 - Jul.85 | 3/00 | PAK/6/007 |
| | 2. Radioimmunoassay | 6B | UK | Jun.91 - Jul.91 | 1/11 | PAK/6/007 |

AGENCY TRAINING COURSES WITH PAKISTANI PARTICIPATION

1985 - 1995
(As of 30 September 1995)

| Field | Number of participants | Number of courses |
|--|------------------------|-------------------|
| General atomic energy development | 36 | 22 |
| Nuclear physics | 9 | 9 |
| Nuclear chemistry | 11 | 8 |
| Nuclear raw materials | 4 | 3 |
| Nuclear engineering and technology | 53 | 41 |
| Nuclear techniques in agriculture | 36 | 32 |
| Nuclear medicine | 38 | 28 |
| Nuclear techniques in biology | 12 | 9 |
| Nuclear techniques in industry & hydrology | 89 | 77 |
| Nuclear safety | 71 | 58 |
| TOTAL | 359 | 287 |

**MULTIPLE PARTICIPATION IN AGENCY TRAINING COURSES
BY PAKISTANI NATIONALS
1985 - 1995
(As of 30 September 1995)**

| Name | Course No. | Course title | Year | Location |
|--------------|--|--|------------------------------|--------------------------|
| AHMAD, M. | INT/9/068 (001) RAS/9/009 (001) | ITC on management and disposal of radioactive wastes RTC on national infrastructure for radioactive waste management | 1986 1991 | CAN INS |
| AHMED, M. | RAS/8/008 (052) RAS/8/061 (022) | Regional UNDP/IAEA/RCA train-the-trainers course on ultrasonic testing RTC on non-destructive testing of surface methods (level II) | 1986 1988 | CPR CPR |
| AKHTER | RAS/9/006 (002) RAS/9/006 (004) | RTC on radiation protection RWS on intercomparison for personal dosimeters | 1989 1990 | JPN JPN |
| ALI, MAHBOOB | INT/9/068 (001) RAS/9/006 (001) RAS/9/006 (013) RAS/9/011 (001) | ITC on management and disposal of radioactive wastes RTC on development of infrastructures for ensuring radiation protection Regional (RCA) training course on system of notification, registration, licensing and control of radiation sources and installations RTC on safety and regulation of radiation sources | 1986 1988 1995 1991 | CAN AUL INS MAL |
| ALI, S.M.A. | INT/4/103 (001) INT/9/057 (001) | ITC on qualification of NPP operations personnel ITC on probabilistic safety assessment for NPP operation | 1990 1986 | GER USA |
| ASLAM, M. | INT/4/078 (001) INT/9/103 (001) RAS/9/008 (001) | ITC on advanced nuclear electronics ITC on safety and regulation of radiation sources RTC on the handling and disposal of nuclear wastes | 1985 1990 1988 | AUS USA CPR |
| AYAZUDDIN | INT/4/099 (001) INT/9/120 (001) | ITC on research reactor operation, utilization and safety ITC on decontamination of research reactors and small nuclear facilities | 1988 1991 | FRA FRA |
| AZHAR, Z. | INT/9/086 (001) RER/9/015 (001) | ITC on safety in NPP operation RTC on re-evaluation of seismic safety of NPPs | 1988 1993 | USA/CAN HUN |

**MULTIPLE PARTICIPATION IN AGENCY TRAINING COURSES
BY PAKISTANI NATIONALS
1985 - 1995
(As of 30 September 1995)**

| Name | Course No. | Course title | Year | Location |
|---------------|---|--|----------------------|-------------------|
| BASHIR, T. | RAS/6/010 (001) RAS/6/019 (001) | Regional train-the-trainers course on data processing in radioimmunoassay RTC on application of recent nuclear techniques in the diagnosis of communicable diseases | 1987 1992 | INS THA |
| BUTT | RAS/6/007 (001) RAS/6/018 (001) RAS/6/018 (002) | Regional train-the-trainers course in medical radioimmunoassay RTC on the preparation of basic reagents for the RIA of hepatitis B markers Regional (RCA) training course on advanced methods for local reagent production for RIA hepatitis B markers | 1985 1993 1995 | CPR CPR THA |
| FAROOQ, M. | RAS/8/061 (019) RAS/8/062 (011) | Third regional training demonstration on the use of tracer technology in industry Regional executive management seminar on nucleonic control systems in the steel industry | 1988 1989 | CPR JPN |
| HASIBULLAH | RAS/0/017 (001) RAS/9/020 (001) | RWS on project management and evaluation techniques for TC projects RWS on project design, evaluation and management of IAEA TC projects in the Asia and Pacific region | 1990 1994 | INS MAL |
| HUSAINI | RAS/8/061 (106) RAS/8/069 (001) | RTC on tracer application in industry RTC on applications of nuclear techniques in materials science | 1991 1993 | INS AUL |
| HUSSAIN, S. | INT/4/091 (001) RAS/8/008 (047) | ITC on NPP control and instrumentation RTC on nucleonic instrumentation engineering | 1987 1986 | GER JPN |
| JAFRI, S.E.H. | INT/9/142 (001) RAS/9/006 (013) | ITC on radiation protection Regional (RCA) training course on system of notification, registration, licensing and control of radiation sources and installations | 1994 1995 | FRA INS |
| JAMALUDDIN | RAS/8/061 (050) RAS/8/062 (026) RAS/8/071 (007) | RTC on non-destructive testing of ultrasonics (level III) RWS on weld defect sizing using NDT UNDP/RCA/IAEA regional seminar on the evaluation of NDT test pieces | 1989 1991 1995 | PHI JPN MAL |

**MULTIPLE PARTICIPATION IN AGENCY TRAINING COURSES
BY PAKISTANI NATIONALS
1985 - 1995
(As of 30 September 1995)**

| Name | Course No. | Course title | Year | Location |
|-------------------|-----------------|--|------|----------|
| JAMEEL | INT/9/072 (001) | ITC on planning, preparedness and response to nuclear accidents or radiological emergencies | 1987 | USA |
| | RAS/9/006 (006) | RTC on the basic technique of radiation protection | 1991 | JPN |
| JAVED | INT/9/100 (001) | ITC on radioactivity measurements for environmental monitoring purposes | 1989 | FRA |
| | RAS/2/002 (001) | RTC on reactor and cyclotron production of radioisotopes | 1987 | CPR |
| | RAS/2/005 (001) | RTC on synthesis of modern radiopharmaceuticals | 1995 | THA |
| | RAS/9/006 (011) | RWS on applications of the ICRP's 1990 recommendations for radiation protection | 1993 | MAL |
| KHAN, ABDUL RAB | RAS/7/003 (005) | RWS on radiation sterilization of tissues: An open learning programme | 1993 | VIE |
| | RAS/7/003 (007) | Regional (RCA) training course on open learning techniques applied to radiation sterilization of tissue grafts | 1994 | CPR |
| KHAN, ABDUR RAHIM | RAS/0/015 (021) | Regional (RCA) training course on industrial application of non-destructive testing and evaluation | 1994 | ROK |
| | RAS/8/008 (054) | Sixth RTC on non-destructive testing (level II) | 1986 | JPN |
| | RAS/8/061 (053) | RTC on non-destructive testing of radiography (level III) | 1989 | MAL |
| KHAN, ASGHAR ALI | RAS/8/061 (003) | RWS on qualification and certification of NDT personnel | 1987 | MAL |
| | RAS/8/061 (053) | Sixth RTC on non-destructive testing (level II) | 1989 | MAL |
| | RAS/8/062 (017) | RWS on non-destructive examination on non-metallic materials | 1989 | JPN |
| KHAN, ZAFRULLAH | INT/4/082 (001) | ITC on commissioning of NPPs | 1986 | UK |
| | INT/9/151 (001) | ITC on interim storage of spent fuel from NPPs | 1995 | USA/CAN |
| KHURSHID | RAS/8/061 (011) | RTC on industrial radiation sterilization - quality control and sterility assurance | 1987 | THA |
| | RAS/8/061 (077) | RTC on industrial radiation sterilization - quality control and compatibility of materials | 1990 | IND |

**MULTIPLE PARTICIPATION IN AGENCY TRAINING COURSES
BY PAKISTANI NATIONALS
1985 - 1995
(As of 30 September 1995)**

| Name | Course No. | Course title | Year | Location |
|--------------|-----------------|---|------|----------|
| LATIF | INT/0/047 (001) | ITC on electric system expansion planning (WASP) RTC on integrated energy and electricity planning for nuclear power development with emphasis on ENPEP | 1989 | USA |
| | RER/0/009 (001) | | 1994 | HUN |
| MALIK, I.A. | RAS/5/021 (004) | Regional RCM on the use of isotopes in studies to improve yield and nitrogen fixation of grain legumes in the tropics and sub-tropics of Asia | 1991 | THA |
| | RAS/5/021 (007) | Regional RCM on the use of isotopes in studies to improve yield and nitrogen fixation of grain legumes in the tropics and sub-tropics of Asia | 1993 | AUL |
| | RAS/5/021 (008) | Regional RCM on the use of isotopes in studies to improve yield and N ₂ fixation of grain legumes in the tropics and sub-tropics of Asia | 1994 | IND |
| MANNAN | INT/1/036 (001) | Advanced ITC on elemental analysis by nuclear techniques RWS on safe operation of radiation facilities | 1985 | CPR |
| | RAS/8/070 (009) | | 1995 | JPN |
| MEHMOOD | RAS/6/011 (001) | RTC on the use and preparation of bulk reagents for radioimmunoassay of thyroid-related hormones | 1986 | THA |
| | RAS/6/011 (004) | RTC on diagnosis of viral hepatitis infection by radioimmunoassay | 1991 | CPR |
| MINHAS, M.R. | RAS/0/015 (017) | RWS on radiation processing - The economic benefits | 1993 | CPR |
| | RAS/8/061 (073) | RTC on industrial radiation sterilization, quality control and sterility assurance | 1990 | THA |
| MIRZA | RAS/4/011 (008) | Regional (RCA) training course on research reactor utilization | 1994 | AUL |
| | RAS/8/061 (107) | RTC on model (NDT) qualifying examination for radiography (level III) | 1991 | MAL |
| MUMTAZ, A. | INT/0/047 (001) | ITC on electric system expansion planning (WASP) Fourth RWS on energy, electricity and nuclear power planning RTC on integrated energy and electricity planning for nuclear power development with emphasis on ENPEP | 1989 | USA |
| | RAS/0/013 (005) | | 1990 | ROK |
| | RER/0/009 (001) | | 1994 | HUN |

**MULTIPLE PARTICIPATION IN AGENCY TRAINING COURSES
BY PAKISTANI NATIONALS
1985 - 1995
(As of 30 September 1995)**

| Name | Course No. | Course title | Year | Location |
|--------------|-----------------|--|------|---------------------|
| NASREEN | RAS/7/003 (006) | RWS on total quality systems for tissue banking of radiation-sterilized surgical grafts | 1993 | INS |
| | RAS/8/008 (058) | RTC on radiation sterilization of human tissues | 1986 | SRL |
| QAMRUL HODA | INT/4/084 (001) | ITC on qualification of operational personnel | 1986 | GER |
| | INT/9/113 (001) | ITC on safety in NPP operation: Prevention and management of accidents | 1991 | USA |
| | INT/9/135 (001) | ITC on physical protection of nuclear facilities and materials | 1993 | USA |
| RAZA, I. | RAS/8/062 (001) | Regional (RCA) workshop on photon, electron and neutron dosimetry in radiotherapy | 1987 | ROK |
| | RAS/9/006 (009) | RWS on computer-assisted planning and dosimetry for carcinoma of the cervix | 1992 | IND |
| RIFFAT | RAS/8/061 (102) | RTC on radiation crosslinking technology | 1990 | CPR |
| | RAS/8/070 (002) | RTC on radiation technology for environmental conservation | 1993 | JPN |
| SAJJAD, M.I. | RAS/8/008 (049) | Regional first executive management seminar on industrial tracer applications | 1986 | BGD/INS/ MAL/ROK |
| | RAS/8/061 (019) | Third regional training demonstration on the use of tracer technology in industry | 1988 | CPR |
| | RAS/8/062 (031) | RWS on non-destructive examination of non-metallic materials | 1991 | THA |
| SALMAN | INT/1/014 (001) | Interregional seminar and workshop on calibration procedures in secondary standards dosimetry laboratory | 1987 | TUR |
| | RAS/9/006 (012) | Regional (RCA) workshop on calibration of dosimeters and survey instruments for photons | 1994 | JPN |
| SAMAD | RAS/0/017 (001) | RWS on project management and evaluation techniques for TC projects | 1990 | INS |
| | RAS/0/020 (001) | RWS on project design, evaluation and management of IAEA TC projects in the Asia and Pacific region | 1994 | MAL |
| SATTAR | RAS/5/020 (008) | Regional RCM for RPF1 - Phase III | 1993 | ROK |
| | RAS/5/023 (001) | RTC on the sterile insect technique and F-1 sterility for insect control | 1991 | MAL/JPN |

**MULTIPLE PARTICIPATION IN AGENCY TRAINING COURSES
BY PAKISTANI NATIONALS
1985 - 1995
(As of 30 September 1995)**

| Name | Course No. | Course title | Year | Location |
|--------------------|---|---|----------------------|-----------------------------|
| SHAHID, S.H. | INT/4/104 (001) RAS/0/013 (003) | ITC on planning of management of the nuclear fuel cycle RTC on nuclear power project planning and implementation | 1990 1989 | ARG ROK |
| SHAHID AZIZ SHEIKH | INT/1/032 (001) INT/1/049 (001) | ITC on solid state nuclear track detectors and their application ITC on nuclear data and measurement techniques in nuclear reactor and personal neutron dosimetry | 1985 1992 | GER RUS |
| SHAMSHAD | RAS/8/008 (055) RAS/8/061 (012) | Regional second training demonstration on radiation crosslinking applications in the wire and cable industry RTC on radiation engineering - Electron beam facilities | 1986 1987 | CPR JPN |
| SHOWKET | INT/4/086 (001) INT/9/104 (001) | Interregional study tour on research reactor utilization ITC on safety in the operation of research reactors | 1986 1990 | FRA/GER/ USSR/YUG USA |
| SYED, N.A. | RAS/8/061 (006) RAS/8/061 (026) RAS/8/061 (072) | RWS on non-destructive testing of non-metallic materials RTC on non-destructive testing of eddy currents (level II) RTC on non-destructive testing of ultrasonics (level III) | 1987 1988 1990 | JPN ROK INS |
| TARIQ | INT/9/087 (001) RAS/0/015 (019) RAS/8/061 (105) | ITC on probabilistic safety assessment (PSA) in safety decision - managerial perspectives RTC on industrial applications of NDT and evaluation RTC on non-destructive testing of magnetic particle and liquid penetrant (level III) | 1988 1993 1991 | UK ROK INS |
| TILOKAR | RAS/8/061 (008) RAS/8/061 (076) | RTC on non-destructive testing of ultrasoncis (level II) RTC on non-destructive testing of radiography (level III) | 1987 1990 | ROK PHI |

**MULTIPLE PARTICIPATION IN AGENCY TRAINING COURSES
BY PAKISTANI NATIONALS
1985 - 1995
(As of 30 September 1995)**

| Name | Course No. | Course title | Year | Location |
|-----------|-----------------|---|------|----------|
| ULLAH, K. | RAS/8/008 (030) | UNDP regional industrial training-demonstration on radiation curing of surface of wood products | 1985 | INS |
| | RAS/8/061 (011) | RTC on industrial radiation sterilization - quality control and sterility assurance | 1987 | THA |
| | RAS/8/070 (005) | UNDP/RCA/IAEA RWS on radiational processing in industry - process control and dosimetry | 1994 | JPN |
| WYNE | RAS/0/015 (005) | RWS on technology and utilization of low-power research reactors | 1990 | CPR |
| | RAS/4/013 (001) | RTC on use of personal computers in research reactor operation | 1991 | INS |
| YASIN | RAS/8/062 (030) | RTC on electron beam irradiation technology | 1991 | CPR |
| | RAS/8/064 (003) | RTC on radiation curing of surface coatings | 1991 | AUL |
| YUSUF, F. | RAS/5/021 (005) | Regional RCM on the use of isotopes in studies to improve yield and nitrogen fixation of grain legumes in the tropics and sub-tropics of Asia | 1992 | CPR |
| | RAS/5/021 (007) | Regional RCM on the use of isotopes in studies to improve yield and nitrogen fixation of grain legumes in the tropics and sub-tropics of Asia | 1993 | AUL |
| ZAHEER | RAS/6/007 (001) | Regional train-the-trainers course in medical radioimmunoassay | 1985 | CPR |
| | RAS/7/004 (001) | RTC on application of radiation and radioisotope techniques in biological sciences significant for human health problems | 1990 | JPN |
| ZAIDI, P. | RAS/6/008 (001) | RTC on hospital radiopharmacy | 1985 | AUL |
| | RAS/6/011 (001) | RTC on the use and preparation of bulk reagents for radioimmunoassay of thyroid-related hormones | 1986 | THA |
| | RAS/7/004 (001) | RTC on application of radiation and radioisotope techniques in biological sciences significant for human health problems | 1990 | JPN |

PROJECTS COMPLETED IN PAKISTAN SINCE 1985
(As of 30 September 1995)

| STARTED | PROJECT NO. | TITLE | ALLOTMENTS | | | | DISBURSEMENTS | | | | COMPLETED |
|---------|-------------|--|------------|---------|-----------|----------|---------------|---------|-----------|----------|-----------|
| | | | EXPERTS | | EQUIPMENT | TRAINING | EXPERTS | | EQUIPMENT | TRAINING | |
| | | | M/M | \$ | \$ | \$ | M/M | \$ | \$ | \$ | |
| 1982 | PAK/0/003 | INIS data base | 0/08 | 1 880 | 227 198 | - | 0/08 | 6 860 | 227 198 | - | 1991 |
| 1989 | PAK/0/004 | National workshop for evaluation of projects | 1/00 | 10 000 | - | - | 0/27 | 7 603 | - | - | 1990 |
| 1979 | PAK/1/019 | Secondary standards dosimetry laboratory | 5/00 | 23 450 | 366 163 | - | 4/17 | 15 992 | 366 162 | - | 1987 |
| 1984 | PAK/1/020 | Development of track dosimeters | 0/26 | 5 720 | 98 328 | - | 0/26 | 6 558 | 98 328 | - | 1990 |
| 1977 | PAK/3/005 | Uranium prospection | 23/02 | 117 380 | 3 947 | 3 443 | 23/02 | 164 119 | 3 947 | 3 443 | 1991 |
| 1978 | PAK/4/017 | Quality assurance | 3/18 | 20 000 | 48 049 | - | 3/18 | 46 822 | 48 048 | - | 1990 |
| 1981 | PAK/4/023 | KANUPP electronic systems development | 1/00 | 5 400 | 169 679 | - | 1/00 | 6 141 | 169 679 | - | 1991 |
| 1982 | PAK/4/024 | NPP electronics and computer maintenance | - | - | 18 000 | - | - | - | 18 383 | - | 1990 |
| 1984 | PAK/4/027 | Control and instrumentation | 2/00 | 13 800 | 226 523 | - | 2/14 | 22 872 | 226 632 | - | 1992 |
| 1986 | PAK/4/028 | Heavy water standardization | - | - | 14 809 | - | - | - | 14 809 | - | 1990 |

PROJECTS COMPLETED IN PAKISTAN SINCE 1985
(As of 30 September 1995)

| STARTED | PROJECT NO. | TITLE | ALLOTMENTS | | | | DISBURSEMENTS | | | | COMPLETED |
|---------|-------------|---|------------|--------|-----------|----------|---------------|--------|-----------|----------|-----------|
| | | | EXPERTS | | EQUIPMENT | TRAINING | EXPERTS | | EQUIPMENT | TRAINING | |
| | | | M/M | \$ | \$ | \$ | M/M | \$ | \$ | \$ | |
| 1986 | PAK/4/029 | Nuclear equipment maintenance | - | - | 29 785 | - | - | - | 29 785 | - | 1991 |
| 1987 | PAK/4/030 | Research reactor conversion development | 4/04 | 31 320 | 38 823 | 53 020 | 4/04 | 41 720 | 38 823 | 47 246 | 1994 |
| 1986 | PAK/4/031 | Radioisotope dispensing | 0/06 | 1 410 | 736 | 5 210 | 0/06 | 1 002 | 758 | 5 209 | 1990 |
| 1988 | PAK/4/032 | Quality assurance (phase II) | 3/25 | 30 060 | 75 491 | - | 4/00 | 40 549 | 75 435 | - | 1994 |
| 1989 | PAK/4/035 | Upgrading of NPP control and instrumentation system | 4/07 | 52 805 | - | 2 132 | 3/19 | 40 679 | - | 2 132 | 1994 |
| 1982 | PAK/5/017 | Radioisotopes in agriculture | 2/10 | 12 800 | 92 411 | - | 2/10 | 12 911 | 92 579 | - | 1992 |
| 1983 | PAK/5/018 | Sterile insect technique | 3/00 | 21 155 | 148 349 | 25 126 | 2/17 | 16 078 | 149 366 | 27 051 | 1994 |
| 1983 | PAK/5/019 | Radiation preservation of dried fruit | 2/19 | 17 380 | 23 731 | - | 2/19 | 19 838 | 23 730 | - | 1990 |
| 1985 | PAK/5/022 | Isotope-aided studies on saline soils | 4/23 | 36 120 | 38 772 | 46 800 | 4/23 | 40 747 | 38 796 | 46 800 | 1992 |

PROJECTS COMPLETED IN PAKISTAN SINCE 1985
(As of 30 September 1995)

| STARTED | PROJECT NO. | TITLE | ALLOTMENTS | | | | DISBURSEMENTS | | | | COMPLETED |
|---------|-------------|---|------------|--------|-----------|----------|---------------|--------|-----------|----------|-----------|
| | | | EXPERTS | | EQUIPMENT | TRAINING | EXPERTS | | EQUIPMENT | TRAINING | |
| | | | M/M | \$ | \$ | \$ | M/M | \$ | \$ | \$ | |
| 1987 | PAK/5/024 | Toxic elements in foodstuffs | - | - | 15 577 | - | - | - | 15 578 | - | 1990 |
| 1989 | PAK/5/025 | Mutation breeding of sugar-cane | 1/27 | 15 960 | 45 900 | - | 1/27 | 21 472 | 46 041 | - | 1994 |
| 1982 | PAK/6/007 | Radioimmunoassay | 4/09 | 29 221 | 75 517 | 25 132 | 4/16 | 34 016 | 75 515 | 23 595 | 1992 |
| 1984 | PAK/6/009 | Nuclear cardiology services | 10/02 | 69 960 | 47 853 | 17 000 | 10/07 | 70 260 | 47 853 | 16 637 | 1992 |
| 1988 | PAK/6/011 | Radiation therapy | - | - | 14 336 | - | - | - | 14 336 | - | 1991 |
| 1989 | PAK/6/012 | Preparation and quality control of radiopharmaceuticals | 0/26 | 7 020 | 82 483 | 16 158 | 0/26 | 9 526 | 82 509 | 16 158 | 1992 |
| 1989 | PAK/6/013 | Upgrading of a teletherapy facility | - | - | 182 958 | - | - | - | 182 668 | - | 1994 |
| 1982 | PAK/8/005 | Isotopes in hydrology | 0/07 | 1 260 | 44 600 | - | 0/07 | 8 725 | 44 696 | - | 1990 |
| 1984 | PAK/8/006 | Gamma radiography | - | - | 32 981 | - | - | - | 34 455 | - | 1991 |
| 1987 | PAK/8/007 | Water resource studies | - | - | 49 908 | - | - | - | 49 908 | - | 1990 |

PROJECTS COMPLETED IN PAKISTAN SINCE 1985
(As of 30 September 1995)

| STARTED | PROJECT NO. | TITLE | ALLOTMENTS | | | | DISBURSEMENTS | | | | COMPLETED |
|---------|--------------|--|--------------|----------------|------------------|----------------|---------------|----------------|------------------|----------------|-----------|
| | | | EXPERTS | | EQUIPMENT | TRAINING | EXPERTS | | EQUIPMENT | TRAINING | |
| | | | M/M | \$ | \$ | \$ | M/M | \$ | \$ | \$ | |
| 1983 | PAK/9/005 | Low-level radiation counting laboratory | - | - | 44 500 | - | - | - | 19 356 | - | 1986 |
| 1984 | PAK/9/006 | Gamma spectroscopy training | - | - | 12 000 | - | - | - | 11 274 | - | 1985 |
| 1985 | PAK/9/007 | Radiation protection | 2/00 | 13 800 | - | - | 2/00 | 12 300 | - | - | 1986 |
| 1987 | PAK/9/008 | Mobile radiation monitoring laboratory | 1/00 | 7 050 | 201 554 | - | 1/08 | 11 622 | 196 922 | - | 1994 |
| 1989 | PAK/9/009 | Automatization of a thermoluminescence dosimetry service | 0/19 | 5 130 | 127 676 | 5 335 | 0/19 | 7 650 | 127 423 | 5 335 | 1994 |
| 1990 | PAK/9/011 | Site safety review mission to Chashma NPP | 2/17 | 40 000 | - | - | 2/17 | 34 375 | - | - | 1991 |
| 1993 | PAK/9/017 | Design & safety review of Chashma NPP ^{1/} | 6/15 | 80 000 | - | - | 6/07 | 80 055 | - | - | 1994 |
| | TOTAL | 37 Projects | 92/05 | 671 556 | 2 731 589 | 215 255 | 91/24 | 783 313 | 2 701 727 | 209 545 | |

^{1/} Includes Funds-in-Trust: \$40 000 under allotments and \$39 716 under disbursements.

OPERATIONAL PROJECTS IN PAKISTAN
(As of 30 September 1995)

| STARTED | PROJECT NO. | TITLE | ALLOTMENTS | | | | DISBURSEMENTS | | | |
|---------|-------------|---|------------|---------|-----------|----------|---------------|---------|-----------|----------|
| | | | EXPERTS | | EQUIPMENT | TRAINING | EXPERTS | | EQUIPMENT | TRAINING |
| | | | M/M | \$ | \$ | \$ | M/M | \$ | \$ | \$ |
| 1993 | PAK/0/005 | Manpower development | - | - | - | 222 277 | - | - | - | 124 103 |
| 1995 | PAK/0/006 | Energy and nuclear power planning study | 1/25 | 20 900 | - | 15 100 | 1/29 | 21 837 | - | - |
| 1995 | PAK/0/007 | Manpower development and nuclear technology support | 6/20 | 78 400 | - | 284 846 | 0/09 | 7 600 | - | 46 169 |
| 1989 | PAK/1/022 | Upgrading of secondary standards dosimetry laboratory | 2/01 | 18 145 | 146 426 | 17 800 | 2/01 | 14 175 | 138 766 | 17 678 |
| 1995 | PAK/1/023 | Secondary standards for neutron and environmental dosimetry | - | - | 40 000 | - | - | - | - | - |
| 1991 | PAK/3/008 | Development of uranium resources | 12/00 | 120 240 | 135 996 | 123 999 | 11/05 | 113 637 | 131 965 | 118 703 |
| 1991 | PAK/4/036 | Thermohydraulic analysis of NPPs | 2/15 | 24 000 | - | 31 500 | 1/22 | 21 028 | - | 2 920 |
| 1991 | PAK/4/037 | Corrosion fatigue testing | 1/00 | 9 300 | 132 998 | 27 000 | 1/00 | 10 558 | 134 769 | 17 364 |
| 1993 | PAK/4/038 | Upgrading of training facilities of KNPTC | 7/07 | 79 695 | 148 880 | - | 4/13 | 68 285 | 111 843 | - |

OPERATIONAL PROJECTS IN PAKISTAN
(As of 30 September 1995)

| STARTED | PROJECT NO. | TITLE | ALLOTMENTS | | | | DISBURSEMENTS | | | |
|---------|-------------|--|------------|--------|-----------|----------|---------------|--------|-----------|----------|
| | | | EXPERTS | | EQUIPMENT | TRAINING | EXPERTS | | EQUIPMENT | TRAINING |
| | | | M/M | \$ | \$ | \$ | M/M | \$ | \$ | \$ |
| 1995 | PAK/4/039 | Development of a simulator for a NPP ^{1/} | 5/10 | 64 400 | 120 000 | 30 600 | 0/29 | 15 368 | - | 12 285 |
| 1993 | PAK/5/027 | Integrated management of fruit fly | 2/00 | 21 150 | 18 144 | 20 250 | 1/11 | 27 046 | 18 707 | 13 042 |
| 1993 | PAK/5/028 | Nesting system of termites | 2/00 | 21 150 | 15 000 | 27 900 | 2/07 | 31 032 | 14 943 | 29 618 |
| 1993 | PAK/5/029 | Impact of pesticides on the ecosystem | 2/00 | 22 200 | 24 000 | 39 915 | 1/02 | 15 949 | 24 230 | 41 241 |
| 1993 | PAK/5/030 | Improvement of cotton quality through induced mutation | 1/00 | 10 800 | 50 200 | 22 389 | 1/03 | 13 387 | 48 829 | 22 389 |
| 1993 | PAK/5/031 | Application of bio-technology in agriculture | 0/16 | 5 760 | 40 500 | 41 404 | 0/16 | 7 719 | 40 037 | 38 821 |
| 1995 | PAK/5/032 | Control of pink bollworm to improve cotton production | 7/00 | 82 200 | 55 000 | 56 400 | 1/10 | 25 062 | 13 711 | - |
| 1995 | PAK/5/033 | Development of leaf curl tolerant varieties of cotton | 2/00 | 23 400 | 70 000 | 40 200 | - | - | 13 431 | - |

^{1/} Allotment for equipment includes \$90 000 for sub-contracted development of software.

OPERATIONAL PROJECTS IN PAKISTAN
(As of 30 September 1995)

| STARTED | PROJECT NO. | TITLE | ALLOTMENTS | | | | DISBURSEMENTS | | | |
|---------|-------------|---|------------|---------|-----------|----------|---------------|---------|-----------|----------|
| | | | EXPERTS | | EQUIPMENT | TRAINING | EXPERTS | | EQUIPMENT | TRAINING |
| | | | M/M | \$ | \$ | \$ | M/M | \$ | \$ | \$ |
| 1995 | PAK/5/034 | Genetic improvement of oilseed crops | 0/21 | 7 980 | 40 000 | 26 550 | - | - | 19 365 | - |
| 1991 | PAK/7/002 | Establishment of human tissue bank | 1/00 | 9 300 | 4 600 | 41 968 | 0/28 | 4 190 | 4 483 | 34 048 |
| 1990 | PAK/8/009 | Radiation processing of cable insulation materials | 2/00 | 18 150 | 188 875 | 4 103 | 2/04 | 18 199 | 188 155 | 2 914 |
| 1995 | PAK/8/010 | Radiation processing of cable insulation materials (phase II) | 2/00 | 23 400 | 60 000 | 28 350 | - | - | - | 13 477 |
| 1989 | PAK/9/010 | Safe operation of the Karachi NPP ^{2/} | 22/02 | 315 918 | 239 100 | 221 770 | 19/12 | 331 770 | 226 038 | 174 180 |
| 1991 | PAK/9/012 | National emergency preparedness | 1/00 | 9 300 | 32 000 | 23 171 | 1/01 | 9 063 | 9 063 | 23 171 |
| 1992 | PAK/9/013 | Site evaluation of Chashma NPP | 9/15 | 118 175 | - | 18 450 | 8/29 | 132 444 | - | 5 256 |
| 1993 | PAK/9/014 | Severe accident analysis of 137 MWE Candu-type NPP | 4/00 | 42 750 | 54 300 | 36 900 | 3/17 | 42 601 | 47 832 | 32 563 |

^{2/} Total amounts for experts include sub-contracted expert services: \$107 878 under allotments and \$106 811 under disbursements.

OPERATIONAL PROJECTS IN PAKISTAN
(As of 30 September 1995)

| STARTED | PROJECT NO. | TITLE | ALLOTMENTS | | | | DISBURSEMENTS | | | |
|---------|-------------|--|------------|-----------|-----------|-----------|---------------|-----------|-----------|----------|
| | | | EXPERTS | | EQUIPMENT | TRAINING | EXPERTS | | EQUIPMENT | TRAINING |
| | | | M/M | \$ | \$ | \$ | M/M | \$ | \$ | \$ |
| 1993 | PAK/9/015 | PSA for Chashma nuclear power project | 6/15 | 69 300 | 7 700 | 17 100 | 6/20 | 79 595 | 7 547 | 16 511 |
| 1993 | PAK/9/016 | NPP safety | 5/21 | 61 110 | - | 30 900 | 5/12 | 77 013 | - | - |
| 1995 | PAK/9/018 | Safety support to CHASNUPP | 15/00 | 186 000 | - | 141 960 | 1/18 | 18 985 | - | - |
| 1995 | PAK/9/019 | PSA for Chashma nuclear power project (phase II) | 6/00 | 70 200 | - | 40 500 | 1/17 | 21 390 | - | - |
| | TOTAL | 29 Projects | 130/18 | 1 533 323 | 1 623 719 | 1 633 302 | 82/15 | 1 127 933 | 1 193 714 | 786 453 |

COUNTERPART INSTITUTIONS IN PAKISTAN (I)
(By Project)

| <u>Project No.</u> | <u>Institute</u> | <u>Counterpart(s)</u> |
|--|--|-----------------------|
| <u>GENERAL ATOMIC ENERGY DEVELOPMENT</u> | | |
| PAK/0/003 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | SADIQ |
| PAK/0/004 | Pakistan Atomic Energy Commission, International Affairs and Training, Islamabad | HASIBULLAH |
| PAK/0/005 | Pakistan Atomic Energy Commission, International Affairs and Training, Islamabad | HASIBULLAH |
| PAK/0/006 | Pakistan Atomic Energy Commission, Applied Systems Analysis Group, Islamabad | KHAN, A.M. |
| PAK/0/007 | Pakistan Atomic Energy Commission, International Affairs and Training, Islamabad | HASIBULLAH |
| <u>NUCLEAR PHYSICS AND CHEMISTRY</u> | | |
| PAK/1/019 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | ORFI |
| PAK/1/020 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | KHAN, H.A. |
| PAK/1/022 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | ATA |
| PAK/1/023 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | SALMAN |

COUNTERPART INSTITUTIONS IN PAKISTAN (I)
(By Project)

| <u>Project No.</u> | <u>Institute</u> | <u>Counterpart(s)</u> |
|---|---|-----------------------|
| <u>NUCLEAR RAW MATERIALS</u> | | |
| PAK/3/005 | Pakistan Atomic Energy Commission, Atomic Energy Minerals Centre, Lahore | MUGHAL |
| PAK/3/008 | Pakistan Atomic Energy Commission, Atomic Energy Minerals Centre, Lahore | MUGHAL MANSOOR |
| <u>NUCLEAR ENGINEERING AND TECHNOLOGY</u> | | |
| PAK/4/017 | Pakistan Atomic Energy Commission, Scientific and Engineering Services Directorate, Islamabad | KHAN, A.A. |
| PAK/4/023 | Pakistan Atomic Energy Commission, Karachi Nuclear Power Plant, Karachi | RANGOONWALA |
| PAK/4/024 | Pakistan Atomic Energy Commission, Karachi Nuclear Power Plant, Karachi | SYED SHAMSHAD |
| PAK/4/027 | Pakistan Atomic Energy Commission, Karachi Nuclear Power Plant, Karachi | GHUFRAN-UL-HAQ |
| PAK/4/028 | Pakistan Atomic Energy Commission, Karachi Nuclear Power Plant, Karachi | DURRANI |
| PAK/4/029 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | RANA |
| PAK/4/030 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | KARIM, A. |
| PAK/4/031 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Rawalpindi | KARIM, H.M.A. |

COUNTERPART INSTITUTIONS IN PAKISTAN (I)
(By Project)

| <u>Project No.</u> | <u>Institute</u> | <u>Counterpart(s)</u> |
|--|--|-----------------------|
| <u>NUCLEAR ENGINEERING AND TECHNOLOGY (cont'd)</u> | | |
| PAK/4/032 | Pakistan Atomic Energy Commission, Karachi Nuclear Power Plant, Karachi | MANSUR ALAM |
| PAK/4/035 | Pakistan Atomic Energy Commission, Karachi Nuclear Power Plant, Karachi | IQLEEM |
| PAK/4/036 | Pakistan Atomic Energy Commission, Chashma Nuclear Power Project, Islamabad | GUL |
| PAK/4/037 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | SHAHID |
| PAK/4/038 | Pakistan Atomic Energy Commission, Karachi Nuclear Power Plant, Karachi | SIDDIQUI, A.A. |
| PAK/4/039 | Pakistan Atomic Energy Commission, Chashma Nuclear Power Project, Islamabad | JAFRI JAIRI |
| <u>AGRICULTURE</u> | | |
| PAK/5/017 | Pakistan Atomic Energy Commission, Atomic Energy Agricultural Research Centre, Tandojam | ARAIN |
| PAK/5/018 | Pakistan Atomic Energy Commission, Atomic Energy Agricultural Research Centre, Tandojam | QURESHI, Z.A. |
| PAK/5/019 | Pakistan Atomic Energy Commission, Nuclear Institute for Food and Agriculture, Peshawar | KHAN, I. |
| PAK/5/022 | Pakistan Atomic Energy Commission, Nuclear Institute for Agriculture and Biology, Faisalabad | NAQVI |

COUNTERPART INSTITUTIONS IN PAKISTAN (I)
(By Project)

| <u>Project No.</u> | <u>Institute</u> | <u>Counterpart(s)</u> |
|-----------------------------|---|--------------------------------------|
| <u>AGRICULTURE (cont'd)</u> | | |
| PAK/5/024 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | QURESHI, I.H. |
| PAK/5/025 | Pakistan Atomic Energy Commission, Atomic Energy Agricultural Research Centre, Tandojam | SIDDIQUI, S.H. |
| PAK/5/027 | Pakistan Atomic Energy Commission, Atomic Energy Agricultural Research Centre, Tandojam | QURESHI, Z.A. |
| PAK/5/028 | Pakistan Atomic Energy Commission, Nuclear Institute for Food and Agriculture, Peshawar | SALIH AH |
| PAK/5/029 | Pakistan Atomic Energy Commission, Nuclear Institute for Agriculture and Biology, Faisalabad | HUSSAIN, A. |
| PAK/5/030 | Pakistan Atomic Energy Commission, Atomic Energy Agricultural Research Centre, Tandojam | ARAIN |
| PAK/5/031 | National Institute for Biotechnology and Genetic Engineering, Faisalabad | MALIK |
| PAK/5/032 | 1. Pakistan Atomic Energy Commission, Nuclear Institute for Agriculture and Biology, Faisalabad 2. Pakistan Atomic Energy Commission, Atomic Energy Agricultural Research Centre, Tandojam | TALIB HUSSAIN QURESHI, Z.A. |
| PAK/5/033 | 1. Pakistan Atomic Energy Commission, Nuclear Institute for Agriculture and Biology, Faisalabad 2. National Institute for Biotechnology and Genetic Engineering, Faisalabad | AWAN KHAN, R.M.S.I. SHAH, W.A. |
| PAK/5/034 | Pakistan Atomic Energy Commission, Nuclear Institute for Food and Agriculture, Peshawar | SHAH, S.A. |

COUNTERPART INSTITUTIONS IN PAKISTAN (I)
(By Project)

| <u>Project No.</u> | <u>Institute</u> | <u>Counterpart(s)</u> |
|--------------------------------------|---|-----------------------|
| <u>NUCLEAR MEDICINE</u> | | |
| PAK/6/007 | 1. Pakistan Atomic Energy Commission, Atomic Energy Medical Centre, Mayo Hospital, Lahore | ZAHEER |
| | 2. Pakistan Atomic Energy Commission, Atomic Energy Medical Centre, Liaquat Medical College and Hospital, Jamshoro | KHAN, A.R. |
| PAK/6/009 | 1. Pakistan Atomic Energy Commission, Nuclear Medicine, Oncology and Radiotherapy Institute, Islamabad | KIZILBASH |
| | 2. Pakistan Atomic Energy Commission, Atomic Energy Medical Centre, Liaquat Medical College and Hospital, Jamshoro | KHAN, A.R. |
| | 3. Pakistan Atomic Energy Commission, Atomic Energy Medical Centre, Nishtar Medical College and Hospital, Multan | AKHTAR |
| PAK/6/011 | Pakistan Atomic Energy Commission, Atomic Energy Medical Centre, Liaquat Medical College and Hospital, Jamshoro | KHAN, A.R. |
| PAK/6/012 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | JEHANGIR |
| PAK/6/013 | Pakistan Atomic Energy Commission, Atomic Energy Medical Centre, Liaquat Medical College and Hospital, Jamshoro | KHAN, A.R. |
| <u>NUCLEAR TECHNIQUES IN BIOLOGY</u> | | |
| PAK/7/002 | Pakistan Atomic Energy Commission, Atomic Energy Medical Centre, Liaquat Medical College and Hospital, Jamshoro | KHAN, A.R. |

COUNTERPART INSTITUTIONS IN PAKISTAN (I)
(By Project)

| <u>Project No.</u> | <u>Institute</u> | <u>Counterpart(s)</u> |
|---|--|-----------------------|
| <u>NUCLEAR TECHNIQUES IN INDUSTRY AND HYDROLOGY</u> | | |
| PAK/8/005 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | HUSSAIN, S.D. |
| PAK/8/006 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | SAJJAD |
| PAK/8/007 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | HUSSAIN, S.D. |
| PAK/8/008 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | HUSSAIN, S.D. |
| PAK/8/009 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | SHAMSHAD |
| PAK/8/010 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | SHAMSHAD |
| <u>NUCLEAR SAFETY</u> | | |
| PAK/9/005 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | ORFI |
| PAK/9/006 | Pakistan Atomic Energy Commission, Karachi Nuclear Power Plant, Karachi | KHAN, S. |
| PAK/9/007 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | - |
| PAK/9/008 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | ATTA |

COUNTERPART INSTITUTIONS IN PAKISTAN (I)
(By Project)

| <u>Project No.</u> | <u>Institute</u> | <u>Counterpart(s)</u> |
|--------------------------------|--|-----------------------|
| <u>NUCLEAR SAFETY (cont'd)</u> | | |
| PAK/9/009 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Rawalpindi | ATTA |
| PAK/9/010 | Pakistan Atomic Energy Commission, Karachi Nuclear Power Plant, Karachi | GHAFOOR |
| PAK/9/011 | Pakistan Atomic Energy Commission, Chashma Nuclear Power Project, Islamabad | SHAFIQUE |
| PAK/9/012 | Pakistan Atomic Energy Commission, Pakistan Institute of Nuclear Science and Technology, Islamabad | HASAN |
| PAK/9/013 | Pakistan Atomic Energy Commission, Chashma Nuclear Power Project, Islamabad | SHAFIQUE |
| PAK/9/014 | Pakistan Atomic Energy Commission, Directorate of Nuclear Safety and Radiation Protection, Islamabad | SIDDIQI, M.A. |
| PAK/9/015 | Pakistan Atomic Energy Commission, Chashma Nuclear Power Project, Islamabad | SHAHID |
| PAK/9/016 | Pakistan Atomic Energy Commission, Directorate of Nuclear Safety and Radiation Protection, Islamabad | HABIB |
| PAK/9/017 | Pakistan Atomic Energy Commission, Islamabad | AHMAD |
| PAK/9/018 | Pakistan Atomic Energy Commission, Chashma Nuclear Power Project, Islamabad | BEG |
| PAK/9/019 | Pakistan Atomic Energy Commission, Chashma Nuclear Power Project, Islamabad | SHAHID |

COUNTERPART INSTITUTIONS IN PAKISTAN (II)
(By Institute)

ISLAMABAD

Pakistan Atomic Energy Commission
Islamabad

PAK/9/017 Design and Safety Review of Chashma Nuclear Power Plant

Pakistan Atomic Energy Commission
Pakistan Institute of Nuclear Science and Technology
Islamabad

PAK/0/003 INIS Data Base
PAK/1/019 Secondary Standards Dosimetry Laboratory
PAK/1/020 Development of Track Dosimeters
PAK/1/022 Upgrading of Secondary Standards Dosimetry Laboratory
PAK/1/023 Secondary Standards for Neutron and Environmental Dosimetry
PAK/4/029 Nuclear Equipment Maintenance
PAK/4/030 Research Reactor Conversion Development
PAK/4/037 Corrosion Fatigue Testing
PAK/5/024 Toxic Elements in Foodstuffs
PAK/6/012 Preparation and Quality Control of Radiopharmaceuticals
PAK/8/005 Isotopes in Hydrology
PAK/8/006 Gamma Radiography
PAK/8/007 Water Resource Studies
PAK/8/008 Investigation of Seepage from Canals
PAK/8/009 Radiation Processing of Cable Insulation Materials
PAK/8/010 Radiation Processing of Cable Insulation Materials (Phase II)
PAK/9/005 Low-Level Radiation Counting Laboratory
PAK/9/007 Radiation Protection
PAK/9/008 Mobile Radiation Monitoring Laboratory
PAK/9/012 National Emergency Preparedness

Pakistan Atomic Energy Commission
International Affairs and Training
Islamabad

PAK/0/004 National Workshop for Evaluation of Projects
PAK/0/005 Manpower Development
PAK/0/007 Manpower Development and Nuclear Technology Support

COUNTERPART INSTITUTIONS IN PAKISTAN (II)
(By Institute)

ISLAMABAD

**Pakistan Atomic Energy Commission
Applied Systems Analysis Group
Islamabad**

PAK/0/006 Energy and Nuclear Power Planning Study

**Pakistan Atomic Energy Commission
Scientific and Engineering Services Directorate
Islamabad**

PAK/4/017 Quality Assurance

**Pakistan Atomic Energy Commission
Chashma Nuclear Power Project
Islamabad**

PAK/4/036 Thermohydraulic Analysis of Nuclear Power Plants
PAK/4/039 Development of a Simulator for a Nuclear Power Plant
PAK/9/011 Site Safety Review Mission to Chashma Nuclear Power Plant
PAK/9/013 Site Evaluation of Chashma Nuclear Power Plant
PAK/9/015 PSA for Chashma Nuclear Power Project
PAK/9/018 Safety Support to CHASNUPP
PAK/9/019 PSA for Chashma Nuclear Power Project (Phase II)

**Pakistan Atomic Energy Commission
Nuclear Medicine, Oncology and Radiotherapy Institute
Islamabad**

PAK/6/009 Nuclear Cardiology Services

**Pakistan Atomic Energy Commission
Directorate of Nuclear Safety and Radiation Protection
Islamabad**

PAK/9/014 Severe Accident Analysis of 137 MWE Candu-Type NPP
PAK/9/016 Nuclear Power Plant Safety

COUNTERPART INSTITUTIONS IN PAKISTAN (II)
(By Institute)

KARACHI

Pakistan Atomic Energy Commission
Karachi Nuclear Power Plant
Karachi

| | |
|-----------|---|
| PAK/4/023 | KANUPP Electronic Systems Development |
| PAK/4/024 | Nuclear Power Plant Electronics and Computer Maintenance |
| PAK/4/027 | Control and Instrumentation |
| PAK/4/028 | Heavy Water Standardization |
| PAK/4/032 | Quality Assurance (Phase II) |
| PAK/4/035 | Upgrading of Nuclear Power Plant Control and Instrumentation System |
| PAK/4/038 | Upgrading of Training Facilities of KNPTC |
| PAK/9/006 | Gamma Spectroscopy Training |
| PAK/9/010 | Safe Operation of the Karachi Nuclear Power Plant |

LAHORE

Pakistan Atomic Energy Commission
Atomic Energy Minerals Centre
Lahore

| | |
|-----------|----------------------------------|
| PAK/3/005 | Uranium Prospection |
| PAK/3/008 | Development of Uranium Resources |

Pakistan Atomic Energy Commission
Atomic Energy Medical Centre
Mayo Hospital
Lahore

| | |
|-----------|------------------|
| PAK/6/007 | Radioimmunoassay |
|-----------|------------------|

COUNTERPART INSTITUTIONS IN PAKISTAN (II)
(By Institute)

RAWALPINDI

Pakistan Atomic Energy Commission
Pakistan Institute of Nuclear Science and Technology
Rawalpindi

| | |
|-----------|--|
| PAK/4/031 | Radioisotope Dispensing |
| PAK/9/009 | Automatization of a Thermoluminescence Dosimetry Service |

TANDOJAM

Pakistan Atomic Energy Commission
Atomic Energy Agricultural Research Centre
Tandojam

| | |
|-----------|--|
| PAK/5/017 | Radiolotopes in Agriculture |
| PAK/5/018 | Sterile Insect Technique |
| PAK/5/025 | Mutation Breeding of Sugar-Cane |
| PAK/5/027 | Integrated Management of Fruit Fly |
| PAK/5/030 | Improvement of Cotton Quality through Induced Mutation |
| PAK/5/032 | Control of Pink Bollworm to Improve Cotton Production |

PESHAWAR

Pakistan Atomic Energy Commission
Nuclear Institute for Food and Agriculture
Peshawar

| | |
|-----------|---------------------------------------|
| PAK/5/019 | Radiation Preservation of Dried Fruit |
| PAK/5/028 | Nesting System of Termites |
| PAK/5/034 | Genetic Improvement of Oil Seed Crops |

COUNTERPART INSTITUTIONS IN PAKISTAN (II)
(By Institute)

FAISALABAD

**Pakistan Atomic Energy Commission
Nuclear Institute for Agriculture and Biology
Faisalabad**

| | |
|-----------|---|
| PAK/5/022 | Isotope-Aided Studies on Saline Soils |
| PAK/5/029 | Impact of Pesticides on the Ecosystem |
| PAK/5/032 | Control of Pink Bollworm to Improve Cotton Production |
| PAK/5/033 | Development of Leaf Curl Tolerant Varieties of Cotton |

**National Institute for Biotechnology and Genetic Engineering
Faisalabad**

| | |
|-----------|---|
| PAK/5/031 | Application of Biotechnology in Agriculture |
| PAK/5/033 | Development of Leaf Curl Tolerant Varieties of Cotton |

JAMSHORO

**Pakistan Atomic Energy Commission
Atomic Energy Medical Centre
Liaquat Medical College and Hospital
Jamshoro**

| | |
|-----------|-------------------------------------|
| PAK/6/007 | Radioimmunoassay |
| PAK/6/009 | Nuclear Cardiology Services |
| PAK/6/011 | Radiation Therapy |
| PAK/6/013 | Upgrading of a Teletherapy Facility |
| PAK/7/002 | Establishment of Human Tissue Bank |

MULTAN

**Pakistan Atomic Energy Commission
Atomic Energy Medical Centre
Nishtar Medical College and Hospital
Multan**

| | |
|-----------|-----------------------------|
| PAK/6/009 | Nuclear Cardiology Services |
|-----------|-----------------------------|

**THE AGENCY'S TECHNICAL CO-OPERATION PROGRAMME WITH
PAKISTAN
(1985 - 1995)**

LONG-TERM EXPERT ASSIGNMENTS

NONE

RESEARCH CONTRACTS/AGREEMENTS IN PAKISTAN SINCE 1985 ^{1/}
(As of 30 September 1995)

| Field of activity | No. of contracts/ agreements | Amount allocated \$ |
|--|---------------------------------|---------------------------|
| General atomic energy development | 1 | 18 000 |
| Nuclear physics | 2 | 13 500 |
| Nuclear chemistry | 6 | 42 300 |
| Nuclear engineering and technology | 10 | 99 900 |
| Nuclear techniques in agriculture | 37 | 457 270 |
| Nuclear medicine | 22 | 183 500 |
| Nuclear techniques in biology | 7 | 80 000 |
| Nuclear techniques in industry & hydrology | 8 | 83 443 |
| Safety in nuclear energy | 6 | 55 400 |
| TOTAL | 99 | 1 033 313 |

^{1/} New awards since 1985.

**SCIENTISTS FROM PAKISTAN SERVING AS AGENCY
TECHNICAL CO-OPERATION EXPERTS AND
TRAINING COURSE LECTURERS
OR
PARTICIPATING IN CO-ORDINATION MEETINGS
1985 - 1995
(As of 30 September 1995)**

| Name | No. of assignments | Project(s) |
|------------------------|--------------------|---|
| ABID ANWAR | 1 | PAK/4/035 |
| ABIDIN | 1 | RAS/8/062 |
| AHMAD, IFTKHAR | 1 | MYA/6/014 |
| AHMAD, MOHAMMAD | 3 | RAS/0/013, RAS/0/021 |
| AHMAD, NASIR | 1 | JOR/2/003 |
| AHMAD, SHAKEEL | 1 | INT/9/064 |
| AHMAD, SHUJAAT | 3 | RAS/8/071, RAS/9/006 |
| AHMED, ASHFAQUE | 1 | PAK/9/010 |
| AHMED, KAMALUDDIN | 1 | RAS/6/011 |
| AKHTER | 1 | RAS/9/006 |
| ALAM | 2 | VIE/4/010 |
| ANWAR | 1 | RAS/9/006 |
| ARSHAD | 1 | BGD/4/019 |
| AWAN | 2 | COL/5/008 |
| AZAM MUNSHI | 1 | PAK/4/035 |
| BEG | 2 | PAK/9/015, PAK/9/018 |
| BUTT, NOOR MOHAMMAD | 9 | RAS/8/008, RAS/8/011, RAS/8/061, RAS/8/062, RAS/8/071 |
| BUTT, WAQAR MURTAZA | 1 | PAK/9/010 |
| CHAUDHRI, M. ARIF | 1 | NIR/0/004 |
| CHAUDHRI, SHAMIM AHMED | 4 | INT/0/045, RAS/8/062, RAS/8/070 |
| CHAUDHRY | 2 | PAK/0/006, PAK/4/038 |
| DAUD BEG | 1 | RAS/0/023 |

**SCIENTISTS FROM PAKISTAN SERVING AS AGENCY
TECHNICAL CO-OPERATION EXPERTS AND
TRAINING COURSE LECTURERS
OR
PARTICIPATING IN CO-ORDINATION MEETINGS
1985 - 1995
(As of 30 September 1995)**

| Name | No. of assignments | Project(s) |
|-----------------------|--------------------|--|
| FAROOQ | 1 | RAS/8/061 |
| GHAFOOR | 2 | PAK/9/010, ROM/9/016 |
| GUL | 1 | RAS/0/019 |
| HABIB | 1 | INT/5/123 |
| HAIDER | 2 | SRL/1/006 |
| HASAN | 2 | PAK/9/010 |
| HASHIMI | 1 | PAK/9/013 |
| HASHMI | 7 | INT/4/075, PAK/9/010, PAK/9/015 |
| HASIBULLAH | 4 | RAS/0/015, RAS/5/021, RAS/8/062, RAS/8/071 |
| HUSSAIN, IMTIAZ | 2 | PAK/9/010, RAS/4/015 |
| HUSSAIN, SYED DILDAR | 1 | PAK/8/008 |
| JAFRI | 1 | PAK/4/039 |
| JALAL | 6 | INT/0/050, INT/0/055, INT/0/057, PAK/0/006, PAK/4/038, RAS/0/013 |
| JAMALUDDIN | 2 | RAS/8/061 |
| JAVED | 1 | INT/9/055 |
| JEHANGIR | 1 | RAS/0/015 |
| KARIM | 1 | RAS/4/011 |
| KHAN, ABDUL RAB | 2 | RAS/7/003 |
| KHAN, ARSHAD MUHAMMAD | 1 | PAK/0/006 |
| KHAN, ASGHAR ALI | 10 | RAS/8/011, RAS/8/061, RAS/8/068, RAS/8/070, RAS/8/071 |
| KHAN, HAMEED AHMED | 4 | INT/1/032, MEX/0/008, VIE/4/008 |
| KHAN, LIAQUAT ALI | 1 | RAS/4/011 |

**SCIENTISTS FROM PAKISTAN SERVING AS AGENCY
TECHNICAL CO-OPERATION EXPERTS AND
TRAINING COURSE LECTURERS
OR
PARTICIPATING IN CO-ORDINATION MEETINGS
1985 - 1995
(As of 30 September 1995)**

| Name | No. of assignments | Project(s) |
|--------------------------|--------------------|--|
| KHAN, RANA M. SAEED IQBA | 1 | NIR.5.016 |
| KHAN, SHAFQAT RAZA | 1 | RAS/4/015 |
| KHAN, SHAMIM ANWAR | 1 | RAS.4.015 |
| KHAN, SHER MOHAMMAD | 1 | MYA/6/014 |
| KHAN, UMAR HAYAT | 10 | MON/9/004, RAS/4/008, SRL/9/006, VIE/6/019, VIE/9/004, ZIM/6/003 |
| LATIF | 2 | PAK/0/006, PAK/4/038 |
| MAHMOOD | 4 | PAK/9/013, PAK/9/018 |
| MALIK, HAMID | 1 | RAS/4/008 |
| MALIK, ILYAS AHMAD | 2 | RAS/5/015 |
| MALIK, KAUSER ABDULLA | 7 | ALG/5/015, IRA/5/008, RAS/5/021, SEN/5/021, TUR/5/016 |
| MANSOOR | 1 | PAK/3/008 |
| MANSUR ALAM | 1 | PAK/9/010 |
| MAQBUL | 1 | PAK/9/014 |
| MOHAMMAD | 3 | PAK/9/012, RAS/9/006 |
| MUGHAL | 1 | PAK/3/008 |
| MUHAMMAD | 1 | PAK/9/010 |
| MUMTAZ | 2 | INT/0/058, PAK/0/006 |
| NAQVI, FARZANA | 1 | PAK/0/006 |
| NAQVI, SYED HASAN M. | 4 | INT/0/053, PAK/5/032, RAS/5/029 |
| NASIM | 1 | SYR/4/004 |
| NIAZ | 1 | RAS/8/062 |
| QAMRUL | 1 | PAK/9/010 |

**SCIENTISTS FROM PAKISTAN SERVING AS AGENCY
TECHNICAL CO-OPERATION EXPERTS AND
TRAINING COURSE LECTURERS
OR
PARTICIPATING IN CO-ORDINATION MEETINGS
1985 - 1995
(As of 30 September 1995)**

| Name | No. of assignments | Project(s) |
|-------------------------|--------------------|---|
| QAZI | 3 | RAS/8/011, RAS/8/062 |
| RAFI | 1 | RAS/6/018 |
| RAHMAN | 2 | INS/9/013, MAL/6/013 |
| RAZZAQ | 1 | PAK/9/014 |
| REHANA | 1 | INS/3/005 |
| SAJJAD, MUHAMMAD ISHAQ | 9 | PHI/8/016, RAS/8/008, RAS/8/061, RAS/8/071 |
| SAJJAD, MUNAWWAR | 1 | INS/4/024 |
| SALMAN | 1 | RAS/9/006 |
| SHAFIQUE | 1 | PAK/9/013 |
| SHAHID, MAQBOOL AHMAD | 5 | MAL/6/013, RAS/6/022, SUD/6/017, VIE/6/017 |
| SHAHID, SHAHID HUSSAIN | 1 | PAK/9/015 |
| SHAMSHAD | 3 | RAS/8/062, RAS/8/070 |
| SIDDIQI, MUHAMMAD AKRAM | 2 | PAK/9/015, ROK/9/033 |
| SIDDIQI, MUHAMMAD TAHIR | 1 | PAK/9/010 |
| SIDDIQUI, AZIZ AHMAD | 1 | INT/0/048 |
| SIDDIQUI, ZIA | 2 | PAK/9/010, RAS/4/015 |
| TARIQ | 3 | RAS/0/012, RAS/0/013 |
| ZAFAR | 1 | PAK/9/014 |
| ZAHEER | 11 | MAR/6/003, RAS/6/011, RAS/6/018, SUD/6/014, SUD/6/017 |
| ZAIDI | 1 | INS/3/005 |
| TOTAL | 194 | |

**AGENCY FELLOWSHIPS AND SCIENTIFIC VISITS
HOSTED BY PAKISTAN
1985 - 1995
(As of 30 September 1995)**

| Recipient country | No. of fellowships | No. of scientific visits | TOTAL ¹ |
|-------------------|--------------------|--------------------------|--------------------|
| ALGERIA | - | 1 | 1 |
| BANGLADESH | - | 2 | 2 |
| INDONESIA | 4 | 1 | 5 |
| IRAN | 11 | - | 11 |
| JORDAN | 2 | 5 | 7 |
| LIBYA | 1 | 1 | 2 |
| MALAYSIA | 2 | 4 | 6 |
| NIGERIA | - | 1 | 1 |
| PHILIPPINES | 3 | - | 3 |
| SAUDI ARABIA | 1 | - | 1 |
| SUDAN | 1 | - | 1 |
| SYRIA | - | 1 | 1 |
| TANZANIA | 1 | - | 1 |
| THAILAND | - | 1 | 1 |
| TUNISIA | - | 3 | 3 |
| UGANDA | 2 | - | 2 |
| VIET NAM | 4 | 1 | 5 |
| ZAMBIA | 1 | - | 1 |
| TOTAL | 33 | 21 | 54 |

1./ Includes trainees who have completed or at least started their studies.

**REGIONAL AND INTERREGIONAL GROUP TRAINING EVENTS
HOSTED BY PAKISTAN
1985 - 1995
(As of 30 September 1995)**

| Course No. | Course Title | Partici- pants | Year |
|-----------------|---|-------------------|------|
| RAS/0/013 (006) | RTC on Electric System Expansion Planning | 18 | 1992 |
| RAS/6/017 (001) | RTC on Radiotherapy for Medical Physicists | 9 | 1989 |
| RAS/8/061 (023) | RTC on Non-Destructive Testing of Ultrasonics (Level II) | 12 | 1988 |
| RAS/8/061 (051) | RTC on Non-Destructive Testing of Eddy Currents (Level II) | 11 | 1990 |
| RAS/8/061 (079) | RTC on Tracer Applications in Industry | 10 | 1990 |
| | TOTAL | 60 | |