

International Atomic Energy Agency

THE PROVISION  
OF TECHNICAL ASSISTANCE  
BY THE AGENCY  
WITH SPECIAL REFERENCE  
TO 1970

Report by the Director General

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## List of abbreviations

Agency	International Atomic Energy Agency
CERN	European Organization for Nuclear Research
ECOSOC	Economic and Social Council of the United Nations
EPTA	United Nations Expanded Programme of Technical Assistance (now the Technical Assistance component of the United Nations Development Programme)
FAO	Food and Agriculture Organization of the United Nations
IAEA	International Atomic Energy Agency
ILO	International Labour Organisation
Monaco Laboratory	International Laboratory of Marine Radioactivity at Monaco
MW ) MW(e))	(Megawatt (Megawatt (electric)
NPY	Co-operative Programme for Research in Reactor Physics between the Governments of Norway, Poland and Yugoslavia
SIDA	Swedish International Development Authority
Trieste Centre	International Centre for Theoretical Physics at Trieste
UNDP	United Nations Development Programme
UNDP(SF)	United Nations Development Programme (Special Fund component)
UNDP(TA)	United Nations Development Programme (Technical Assistance component)
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization
<hr/>	
Congo, D. R.	Democratic Republic of the Congo
CSSR	Czechoslovak Socialist Republic
Germany, F. R.	Federal Republic of Germany
Korea, R.	Republic of Korea
Libyan A. R.	Libyan Arab Republic
Syrian A. R.	Syrian Arab Republic
UAR	United Arab Republic
UK	United Kingdom of Great Britain and Northern Ireland
USA	United States of America
USSR	Union of Soviet Socialist Republics

## NOTES

All sums of money are expressed in United States dollars.

The technical assistance described in this report is classified under the following ten fields of activity:

<u>Code</u>	<u>Field of activity</u>
0	General atomic energy development
1	Nuclear physics
2	Nuclear chemistry
3	Prospecting, mining and processing of nuclear materials
4	Nuclear engineering and technology
5	Application of isotopes and radiation in agriculture
6	Application of isotopes and radiation in medicine
7	Application of isotopes and radiation in biology
8	Other fields of application of isotopes and radiation
9	Safety in nuclear energy

## Part I. INTRODUCTION

1. Following its usual practice, the Board of Governors has requested the communication to the General Conference of the material it used in reviewing the provision of technical assistance by the Agency, with special reference to 1970; this material is accordingly reproduced in the present document. The review was carried out pursuant to paragraph 20 of the Guiding Principles and General Operating Rules to Govern the Provision of Technical Assistance by the Agency [ 1 ].
2. The use of the resources placed at the Agency's disposal, in the form of voluntary contributions, gifts in kind and UNDP(TA) funds, for the provision of technical assistance is reviewed in this document and, in Part II, section C, information is given with regard to the UNDP(SF) projects for which the Agency served either as executing agency or as sub-contractor in 1970 (see also Annexes II and III).
3. The three principal elements of the technical assistance provided are expert services, equipment and fellowships. The main objectives of the assistance are to promote the transfer of skills and knowledge relating to the peaceful uses of atomic energy, to support the efforts made by recipient countries to carry out their atomic energy activities more efficiently, and to ensure that the knowledge acquired can continue to be applied after Agency projects have been completed. The achievement of the latter objective, however, depends largely on the ability of Governments to make adequate facilities available and to recruit and retain the requisite number of qualified staff.
4. In 1970, 68 countries received technical assistance in one form or another from the Agency, as shown in Table 7 [ 2 ] and Fig. 4B. Approximately 63% of all assistance provided related to the application of isotopes and radiation in agriculture, nuclear engineering and technology, nuclear physics and the subjects covered by the classification heading "Other fields of application of isotopes and radiation", which includes isotope hydrology and industrial applications.
5. The assistance, including grants of equipment and assistance in kind, was provided through the services of 243 experts, lecturers and visiting professors, the supply of equipment to a value of about \$1 056 000, and 634 fellowships awards for individual study, scientific visits, two study tours and other short-term training projects.
6. The resources allocated for carrying out the Agency's 1970 technical assistance programme amounted to \$3 925 000 (Table 1), whereas the total value of the technical assistance actually provided in 1970 was about \$3 616 000 (Table 7). This includes payments against 1970 and prior years' obligations, as well as assistance in kind, and represents an increase of \$200 000 or 6% over the sum of \$3 416 000 provided in 1969 (Table 4), but does not include the unliquidated obligations and assistance in kind outstanding at the end of the year.

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[ 1 ] GC(IV)/RES/65, Annex.

[ 2 ] The principal statistical tables are given in Annex I to this document.

7. As in earlier reports on the provision of technical assistance by the Agency [ 3 ], details are given below regarding some activities in which Member States have shown special interest in 1970, followed by information concerning other developments relating to technical assistance, and a review of the Agency's exchange and training activities from the inception of the latter two programmes.

A. Technical co-operation activities in which Governments have shown special interest

8. In 1970 more assistance was provided in the application of isotopes and radiation in agriculture than in any other field of activity. With regard to agricultural activities, the largest share of expenditure was devoted to soil fertility, irrigation and crop production projects, followed by food preservation projects, plant breeding and genetics projects, and animal husbandry projects, in that order. The soil fertility, irrigation and crop production activities include topics such as soil chemistry, soil physics, plant physiology and plant nutrition. A thorough knowledge of, as well as the ability to control and modify, existing conditions, are of vital importance in agriculture. In a period of increasing need, the ability to improve the quality and quantity of food crops - without ruining the soil - can ensure the survival of countless millions faced with starvation. In view of the modern nuclear techniques that can be used in solving the problems involved, it is not surprising that the above-mentioned topics figure prominently in the list of approved projects each year. In 1970 projects relating to those topics were carried out successfully in all five geographic regions.

9. In terms of the amount of assistance provided, agricultural projects were followed in 1970 by projects carried out in nuclear engineering and technology; for the third consecutive year, the projects which received most assistance related to nuclear instrumentation and electronics, and these projects are expected to continue to be given high priority in future years because of the importance attached to the construction and maintenance of nuclear equipment. Next in order of importance in 1970, as in 1969, was the production of isotopes; special interest is being shown in this activity and in the production of labelled compounds because of the contribution they make to modern industrial development, while freeing foreign currency for other priority requirements.

10. With regard to nuclear physics activities, most assistance was provided in 1970, as in 1969, for experimental nuclear physics and nuclear spectroscopy projects, followed by those in neutron physics. Next in order of magnitude was the assistance provided in connection with isotope hydrology projects, followed by projects involving industrial applications of isotopes and radiation. The ranking of nuclear chemistry projects in fifth place does not accurately reflect the continuing interest shown in radiochemistry, which accounted for more than 5% of the entire technical assistance provided by the Agency in 1970.

11. Substantial interest continues to be shown in medical applications of isotopes and radiation (especially in diagnostics and clinical research), radiation protection and prospection of nuclear raw materials, even though these activities do not usually receive as large a share of the available resources as the activities mentioned above.

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[ 3 ] See, for example, document GC(XIV)/INF/122.

## B. Other developments

12. In last year's report [ 4 ], reference was made to a Study of the Capacity of the United Nations Development System which was prepared for the Administrator of UNDP by a consultant, Sir Robert Jackson. The review of this study by the UNDP Governing Council commenced at its ninth regular session in January 1970 and will not be completed until the twelfth session of the Council in June 1971.

13. In February 1971 the Director General reported to the Board in a memorandum the major conclusions reached by the Council up to the end of 1970. The Council's main conclusions have been expressed in the form of a "consensus" of considerable length, which in certain respects, is couched in rather general terms, leaving some latitude for interpretation, doubtless because the changes envisaged in the planning, implementation and administration of UNDP are of such a substantial character that the Council will almost certainly have to modify its views to some extent in the light of the experience gained in the first two or three years of the introduction of the new programming procedures. Of the points brought out in the Director General's memorandum, perhaps the main point of concern to the Agency is the new programming system to be adopted in future. The present "country target" will be replaced by a somewhat comparable device which will be called the "indicative planning figure" (IPF), but this will have much less of the sense of a commitment on the part of UNDP than did the previous country target. Moreover, this IPF will cover not only the international aid now being provided under the Technical Assistance component, but also that provided under the Special Fund component, reflecting the Council's decision that the distinction between the two components should be abolished at the earliest possible date (in fact, this will not take place before 1972). The new procedures also envisage that Governments will be expected to assume (with, of course, the assistance of the UNDP Resident Representatives) the entire responsibility for ensuring that the development assistance received from the United Nations family is fully integrated into their national development plans. The mechanism by which this is to be done will of course vary from country to country, but will involve an inevitably complex and somewhat lengthy series of programming exercises in which all organizations will be invited to participate with a view to developing a programme of assistance for a period of three to five years, depending on the duration and timing of the development plan of the country concerned.

14. Important changes in the procedure for developing regional projects will also be introduced. Although the concept of "agency targets" for regional projects was abandoned in 1970, it is still the responsibility of agencies to submit regional projects for approval by the Administrator (or by the Governing Council if the project would cost \$200 000 or more). From 1972 onwards, proposals for regional projects will have to be submitted by Governments themselves, according to such regional groupings as may be appropriate for the particular project. It is clear of course that agencies will still have a major part to play in identifying technical areas in which a regional approach is likely to produce better results than unrelated national activities. Nevertheless, the new procedures for Government submission - coupled with the fact that there is no way of knowing what amount of funds will be available for regional projects in a particular sector - will inevitably complicate regional project programming for the next two or three years. It should also be noted that there was a certain amount of resistance on the part of Council members to the Administrator's suggestion that the percentage of the total funds available for programme activities which could be devoted to regional projects might be increased slightly.

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[ 4 ] Ibid., para. 14.



15. There will also be major changes in the organization and size of the UNDP staff. Much greater authority will be given to the UNDP Resident Representatives, and these will at all times play the leading role in overall programme development in the countries to which they are assigned. At the same time programme responsibilities will be centred in four regional bureaux headed by a senior official with direct access to the Administrator. While these regional bureaux will be located at UNDP headquarters for some time to come, pressure is being brought to bear to have them located, or some of their functions carried out, in the relevant geographic regions.

16. It is clear from the foregoing paragraphs that UNDP is in yet another - and perhaps the most important - phase of its evolution, and it is exceedingly difficult to predict at this time what the consequences will be for the Agency. The major responsibility in ensuring that atomic energy plays its proper part in the developing countries will fall upon the atomic energy commissions or equivalent bodies, working through the national co-ordinating authorities for technical assistance in the countries concerned. However, it will clearly be necessary for the Agency's staff to work very closely with the commissions in this task and to participate in most of the programming exercises which are planned to take place over the period 1971 to 1973. To judge from experience with the "continuous programming" procedures, which were referred to in the last report [ 5 ], the Agency can reasonably expect a continuing increase in the volume of requests for assistance under UNDP(TA). In 1970, there was a quite remarkable increase over previous years (about 30%) in the value of requests approved for implementation by the Agency under UNDP(TA) due to the effectiveness of the follow-up missions and to the sudden removal of restrictions on Governments to choose projects under the new continuous programming procedures. It seems unlikely that the rate of increase in the Agency's share in this programme will exceed 15% during 1971, and based on a conservative estimate, it will probably be about 10% per year as from 1972. This latter figure is of the same order of magnitude as the probable rate of increase in the total assistance to be provided under UNDP.

17. The nature of what are now known as Special Fund projects is even more difficult to predict. By the middle of 1971, the Agency will be responsible for the implementation of at least three new projects of this kind, and, as the recipient countries' technological capacity increases, they may well wish to devote a larger share of the assistance they can request within the framework of their IPFs to atomic energy activities. If they do, it is likely that a number of projects will be of the Special Fund type, that is, that a team of experts will be provided, together with equipment and fellowship training, to ensure maximum impact in strengthening and expanding the scientific infrastructure. At the same time, the introduction of new techniques and technologies would make it possible to conduct detailed research of practical value and local importance that hitherto has been possible only in the more advanced countries.

C. Exchange and training

1. Exchange programme

(a) General

18. The exchange programme aims at improving teaching and research facilities in general and makes use of a wide variety of methods of achieving this objective, including in particular the assignment of visiting professors and scientists, the organization of courses, research and special grants, the sponsorship of visits by

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[ 5 ] GC(XIV)/INF/122, paras 15 and 16.

scientists to foreign centres and, formerly, the use of the mobile radioisotope laboratories. In the following paragraphs the Agency's activities in this respect since the programme started in 1959 are assessed.

(b) Visiting professors

19. It will be seen from the table below that 140 visiting professors have served in the field in the four regions receiving assistance. The breakdown by field of activity reflects the fundamental purpose of the programme, which is to assist in the creation of the scientific infrastructure, particularly the training of science teachers and research workers. To this end, one of the first steps is the introduction of nuclear physics and radiochemistry into the scientific and educational programme of Member States, and research programmes involving the use of nuclear techniques are started in universities and technical institutes.

Distribution of visiting professor assignments 1959-1970

Field of activity	Africa		Americas		Asia and the Far East		Europe and the Middle East		Total	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
General atomic energy development	-	-	-	-	-	-	-	-	-	-
Nuclear physics	8	51	17	222	17	81	18	55	60	409
Nuclear chemistry	4	31	4	35	8	55	9	31	25	152
Prospecting, mining and processing of nuclear materials	1	3	3	13	-	-	-	-	4	16
Nuclear engineering and technology	4	4	3	21	3	26	7	25	17	76
Application of isotopes and radiation in:										
Agriculture	-	-	4	20	-	-	2	19	6	39
Medicine	-	-	5	5	-	-	4	8	9	13
Biology	-	-	3	24	1	3	3	9	7	36
Other fields	2	13	1	3	-	-	2	2	5	18
Safety in nuclear energy	1	6	-	-	1	1	5	5	7	12
<b>Total</b>	<b>20</b>	<b>108</b>	<b>40</b>	<b>343</b>	<b>30</b>	<b>166</b>	<b>50</b>	<b>154</b>	<b>140</b>	<b>771</b>

(1) Number of assignments.

(2) Number of man-months.

20. The programme, which is world-wide in scope, meets regional requirements. In Africa, for example, the emphasis in the provision of assistance has been on nuclear physics and nuclear chemistry. This has encouraged science students in Sierra Leone and Tunisia for instance, to work for honours degrees in physics and chemistry and at the same time enabled students to receive courses in their own countries rather than, as previously, going abroad. This will permit them to undertake teaching, on completion of their university course, in secondary schools. Another objective of several assignments in Africa has been the participation by visiting professors in university research programmes at the post-graduate level.

21. The need to train specialists for the technical services of newly independent African States has been met through the assignment, for short periods, of experts to give lectures on the use of nuclear techniques and instrumentation in mineral prospecting for geologists who will later join the national geological survey, the demonstration of new instruments and techniques for hydrological studies to students, who will later form part of the national hydrological survey, and of radioisotope techniques, with particular reference to multi-purpose instrumentation, for students who will later be assigned to Government research institutes.

22. In the Middle East, visiting professors have been engaged predominantly in research training, for example in radiochemistry and the application of nuclear techniques in agricultural research. The varying stages of development of the atomic energy programmes in different areas is illustrated by the fact that in Europe over 30% of all visiting professors were assigned, usually for short periods, generally to review and set up lines of research or for seminars in narrowly specialized subjects. For example, Austria and Italy made use of the exchange programme to request highly specialized physicists, as did Yugoslavia, which however also received a substantial number of specialists who provided training designed to ensure safety in nuclear energy activities. Turkey made use of the programme almost exclusively for teaching purposes in electronics, nuclear chemistry and nuclear power. In the case of Greece assistance was mainly used to establish research groups in nuclear chemistry and neutron physics.

23. In Asia and the Far East the emphasis on nuclear physics and nuclear chemistry is also evident. In Burma, for example, the Agency provided a number of experts and visiting professors for the physics and chemistry departments of the Rangoon Arts and Science University, to assist in setting up nuclear laboratories at each department and introduce a syllabus of courses, both at the undergraduate and graduate level, for teaching nuclear physics and nuclear chemistry. As a result of these efforts, a number of physics and chemistry graduates obtained Master of Science (M. Sc.) degrees in these subjects in their own country for the first time.

24. In China, a visiting professor in experimental nuclear physics was assigned consecutively to the National Tsing Hua University in Hsinchu and the Taiwan University in Taipei to give lectures on nuclear reactions and related topics and introduce a programme of experiments as teaching aids. Another visiting professor was assigned to the former university to lecture on nuclear and radiochemistry topics with the aim of upgrading the level of courses offered to students.

25. In Thailand, Agency experts will assist in introducing a nuclear engineering curriculum at the Nuclear Engineering School, which is being established at the Chulalongkorn University, to meet the increasing personnel needs of the country's nuclear power programme and thus reduce the number of persons who have to seek this type of training abroad. Another expert will assist in introducing a graduate programme leading to an M. Sc. degree in radiochemistry at the chemistry department of the University.

26. The table above shows that, in Latin America, the exchange programme has been made use of in a very wide variety of fields, and post-project evaluation has revealed that it has been especially useful in helping in the training of local scientists in the more advanced nuclear techniques, which in turn were used to develop comparatively extensive national programmes. The exchange programme has in many cases in Latin America served as the spring-board for the development, for example, of centres to which visiting professors were assigned in the early years of the programme and which have later been used as host centres to train fellows from other countries within the region, under the Agency's as well as bilateral auspices. Because of the training and lectures provided, the Bariloche Institute in Argentina and the Centre for Nuclear Medicine in the University of São Paulo, Brazil, for example, now constitute regional training facilities, thus obviating to a certain extent, the necessity of sending Latin American nationals out of the region.

27. In more recent years, the exchange programme has increasingly been used to train scientifically advanced groups in the region in the more sophisticated nuclear techniques, thereby assisting scientists to overcome the effects of their isolation, which is partly due to the distance separating them from the scientific community in the northern hemisphere. For example, there are now teams working on radioimmunoassay at the Radiobiology Institute at the University of São Paulo, Brazil, radiation genetics in Mexico, and plasma physics at the University of Chile at Santiago. As in other regions, the programme has been used to introduce basic training, usually at educational and research institutes in subjects such as uranium prospection in Bolivia, radiochemistry in Venezuela and the applications of radioisotopes in medicine in Cuba.

28. The foregoing paragraphs show the wide range of subjects covered by the assistance provided by visiting professors. Mention should also be made, however, of the follow-up action which results from the initial contacts made by the professors with their counterparts in the various countries. The contacts made between scientific research workers and visiting professors sent from one region to another have resulted in the creation of informal arrangements and programmes between the institute in the region and the home institute of the visiting professor. The catalytic effect of assistance in regard to scientific education and the creation of a scientific infrastructure is exemplified by the many requests which have been made in recent years for exchange visits, research fellowships, etc.

## 2. Fellowship programme

29. The important role the Agency's fellowship programme plays is exemplified in the continuing participation and co-operation by countries which nominate and those which receive fellows for training. This reflects their conviction that the programme should continue to expand to the extent that financial resources permit, as indicated by the increase in fellowship awards since 1968.

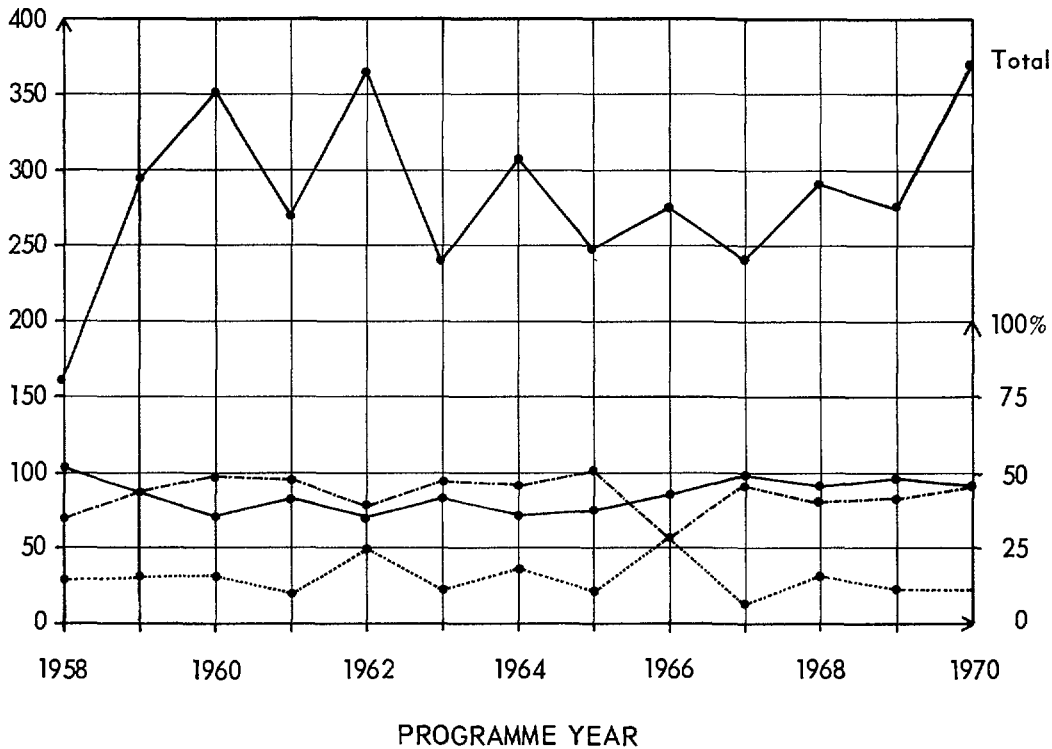
30. Despite the fact that for the developing countries in most need of assistance the Agency is willing to consider requests for relatively unsophisticated, practical training, namely for laboratory technicians, it is surprising that over the years so few nominations have been received from many of these countries. The total number of awards over the period 1958-1970 to several developing countries in urgent need of technical assistance is of the order of magnitude of the number granted to many of the more developed countries in 1970 - or in 1969 and 1970 - alone. This large difference is due solely to the fact that few nominations were received.

31. It is interesting to note that since 1958, the year in which fellowships for individual study were first awarded by the Agency, the annual distribution of awards by field of activity has remained fairly constant. Although there are year-to-year statistical variations, they have been of a minor nature, and no clear trends (no shift in emphasis, for example, from nuclear engineering and technology to other subjects) are evident. The distribution of awards since 1958 has been as follows:

<u>Field of activity</u>	<u>Percentage of total fellowships awarded</u>
General atomic energy development	1
Nuclear physics	21
Nuclear chemistry	11
Prospecting, mining and processing of nuclear materials	4
Nuclear engineering and technology	22
Application of isotopes and radiation in:	
Agriculture	13
Medicine	11
Biology	6
Other fields	4
Safety in nuclear energy	7
	<u>100</u>

32. Up to 31 December 1970, a total of 4503 fellowships had been awarded. Taking into account the known withdrawals at the end of 1970, the total effective awards numbered 3686; of these 1582 were Type I awards (including 86 awards for study at the Trieste Centre over the period 1964-1969), six were Trieste Centre awards in 1970, 1540 were Type II awards, 63 were UNDP(SF) awards and 495 were UNDP(TA) awards. The number of effective Agency fellowship awards for the years 1958-1970, as well as the distribution of awards by source of funds (Type I, Type II, and UNDP), expressed as percentages, are shown below.

Number of effective awards as at 31 December 1970



Type I -----  
 Type II \_\_\_\_\_  
 UNDP .....

In the above chart awards for study at the Trieste Centre are included in Type I awards and UNDP awards include both UNDP(SF) and UNDP(TA) awards. The fluctuation in the number of effective fellowship awards and in the percentage share of effective awards financed under UNDP is attributable, to a limited extent, to the fact that the number of awards is below average in the first year and above average in the second year of a biennial period, beginning with 1961-1962 and ending with 1967-1968.

33. The primary consideration in fellowship management is to provide training which is timely, efficient and effective in relation to the backgrounds of qualified applicants and the requirements of their employers, while ensuring that optimum use is made of available Type II awards and that nominating and host Member States are treated as equitably as possible.

34. The arrangement of training programmes to suit the individual backgrounds and training requirements of fellows and a close watch over these programmes up to the time of completion continue to be one of the main tasks of the Agency in its fellowship administration. When transmitting proposals regarding fellows to the authorities of potential host countries, the Agency states in detail the type of training for which the fellowship is being granted, the objectives of the training and the period within which the training programme must be carried out. The progress of each fellow is reviewed frequently to ensure that the training objectives for which the fellowship was awarded are being satisfactorily met, whenever possible within the period originally foreseen.

35. The Agency has continued to seek ways and means of shortening the time that elapses between the date a nomination is received by the Agency and the commencement of a fellow's training. With this end in view, nominating countries themselves could help if they would ensure that candidates' foreign language qualifications were adequate and expedite the acceptance of proposed fellowship placements which are consistent with nominees' training requirements.

36. As mentioned in previous annual reports, evaluation of the fellowship programme is carried out on a continuing basis. During the period of training the progress reports submitted by fellows and their supervisors at the host institute make it possible to modify a fellow's work programme, if necessary, and keep track of his achievements. In addition, fellows are requested to complete and return a questionnaire which is sent to them about six months following their training. These questionnaires are analysed to determine fellows' assessment of the training received and its relevance to the work they are doing. The questionnaires analysed so far have shown that 95% of the fellows returned to their homelands immediately after completion of their studies abroad under an Agency fellowship. With their Government's consent and at no cost to the Agency, 3% remained abroad for a longer period for further training for advanced degrees or to gain experience; 2% accepted long-term employment abroad.

37. Information provided by fellows who completed training in 1967-68 indicates that 97% were fully satisfied with their work programmes and supervision. The most frequently named reason for dissatisfaction was that the training period was too short, bearing in mind their training requirements in relation to their backgrounds, language qualifications, adaptation to the environment and types of programme (informal as compared with formal). Similar information was provided during the surveys for the period 1965-1967 and earlier.

38. One out of every ten fellows who completed training in 1967-68 considered that his training was being inadequately utilized by his employer, although almost all were confident that matters would improve. Half of the fellows who were dissatisfied attributed the shortcoming to inadequate or insufficient equipment in the home institute. Eight out of every ten fellows obtained results during their training which were considered by their hosts to be worthy of publication in some form. Some fellows were co-authors of several papers, and this has resulted in an average of one journal publication and one internal report per fellow. One out of every ten fellows who had returned home mentioned that a collaborative relationship had been established with his host country supervisor and expressed the hope that it would continue.

39. The impact which the fellowship programme has had on the developing countries, as well as on the developed countries which provided the training is difficult to assess quantitatively. There can be no doubt, however, as to the impact it has made in supplementing other aid designed to improve the educational, scientific, technological and socio-economic infrastructures in several developing countries. In 1971, the Agency will begin a survey of the fellows who completed their training during 1959-1963 to establish, in so far as possible, the extent to which their training, together with the experience gained while abroad, has contributed to the development of these infrastructures, including those related specifically to nuclear energy development and utilization.

### 3. Training courses, study tours, scientific visits and visiting seminars

40. These constitute a considerable proportion of the regional and interregional projects financed under the Agency's regular programme or UNDP(TA). Analysis of the Agency's experience in regard to regional and interregional projects indicates that the effectiveness of a project, however well it is defined or implemented, depends very

largely on the specific development needs, opportunities, and resources of the participating countries. Taking this into account, the Agency has continuously aimed at selecting, formulating and implementing its regional and interregional projects in accordance with the requirements of its Member States.

41. The increase in the number of study tours from one to three and training courses from six to 13 (18 to 19 are planned for 1971) per year and the holding of the majority of training courses in developing countries rather than in technologically advanced countries are examples of the Agency's compliance with the request and fulfilment of the needs of the countries assisted. The early selection of projects, advance arrangements with host countries and the sending out of letters of invitation six to nine months prior to the commencement of projects have given participating countries more time to select a larger number of more suitable candidates for participation in these projects. It is intended to continue to streamline administrative and operational procedures further, so that the optimum results may be obtained from the implementation of the training projects in question.

42. As a result of the Agency's experience in regard to the programme of world-wide scientific visits, in which senior scientists from developing countries are given an opportunity to visit nuclear centres in more advanced countries, a new programme of scientific visits on a regional basis was launched two years ago. The latter programme was carried out on an experimental basis in the regions of South East Asia, Europe and the Middle East. Under this programme the Agency arranged for a limited number of scientists to visit institutes in countries other than their own in their region to study techniques used in their respective fields. This programme was well received by Member States and executed in a spirit of regional co-operation. Over 40 scientists visited countries in their own region, and it is intended to continue this training activity in the coming years.

43. Another interesting activity has been the series of visiting seminars ("mobile training courses"), where a project organized for a region is held consecutively in individual countries. This method of training has the advantage that it permits detailed preliminary consultation and planning for each country on an individual basis; it also permits a larger number of participants to be trained in each country, and the cost is considerably reduced in comparison with that of other regional-type projects. Visiting seminars on food irradiation, radiation protection, safety aspects of power reactors, mineral resources exploitation and related topics have been organized. In view of the positive results obtained, it is expected that this type of training activity will be continued whenever appropriate.

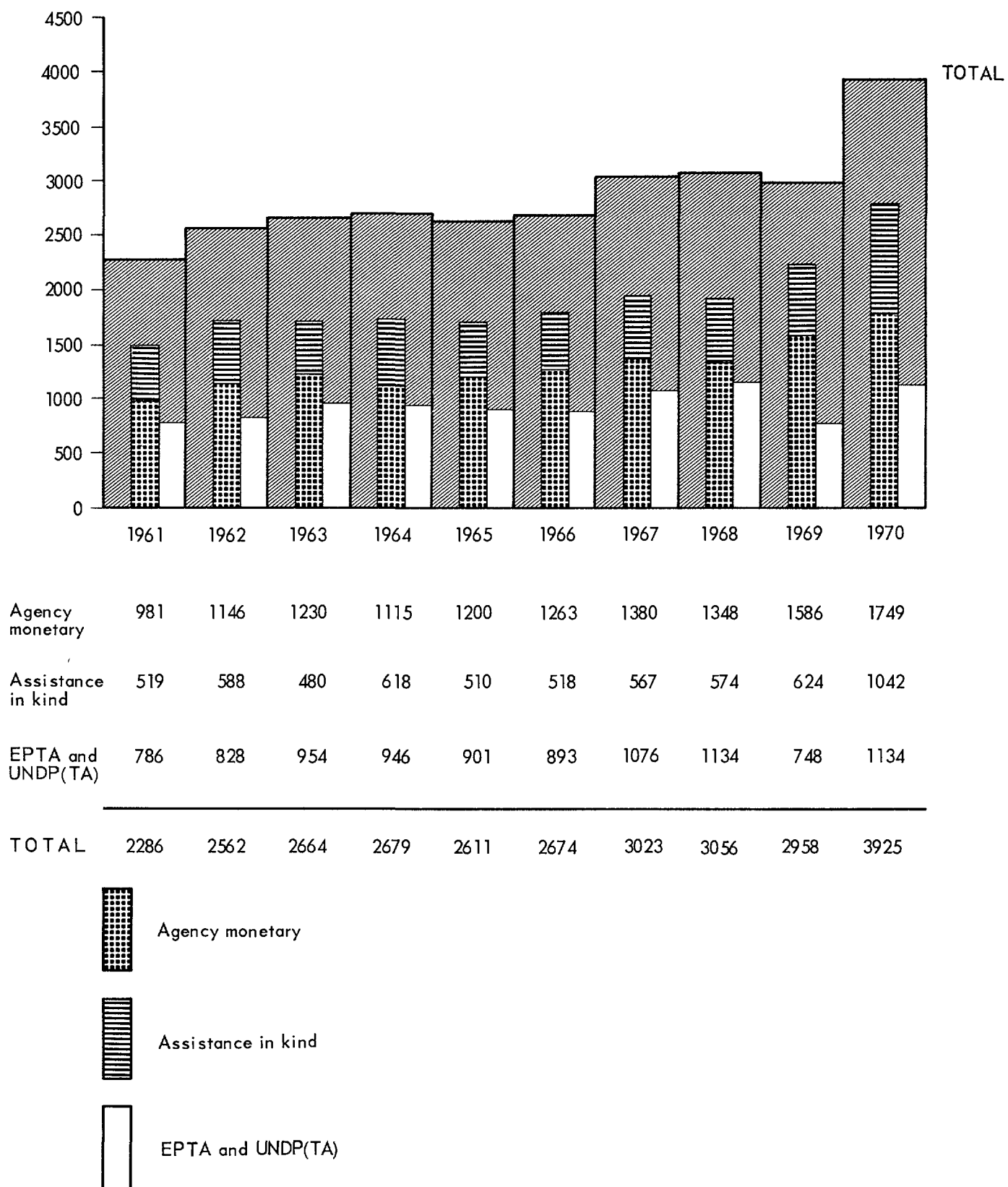
44. To avoid duplication of the activities of other United Nations organizations and to render assistance to Member States which are in the process of building up their scientific infrastructure, the Agency has continued to co-operate with UNESCO during the past years in matters relating to the teaching of nuclear science [ 6 ]. The positive results obtained from the first Panel of Experts on Nuclear Science Teaching held at Bangkok in 1968 led the Agency to convene, in co-operation with UNESCO, another panel on this topic in 1970 at Buenos Aires. The reports of these two panels on the teaching of nuclear science (physics and chemistry) have been of considerable interest to scientists and science educators in developing countries. Follow-up action in the form of further panels, pilot projects and training courses is contemplated. Another area in which the Agency co-operates with UNESCO is the training of hydrologists in the use of isotope techniques. Co-operation with FAO, ILO and WHO has also proven most effective; joint activities which the Agency intends to continue include co-operation with ILO in the training of technical personnel, [ 6 ] the organization of joint training courses and study tours with FAO for training scientists, agronomists and veterinarians in the use of isotopes and radiation in agriculture and animal science, collaboration with WHO in training medical personnel and scientists in the medical applications of radioisotopes, physics in radiotherapy and radiation protection.

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[ 6 ] See General Conference Resolution GC(X)/RES/215.



**FIGURE 1**  
**RESOURCES AVAILABLE FOR AGENCY TECHNICAL ASSISTANCE PROGRAMMES: 1961 - 1970**  
(In thousands of dollars)



## Part II. ANALYSIS OF THE ASSISTANCE PROVIDED

### A. Available resources

#### 1. General

45. The resources available to the Agency in 1970 for the provision of technical assistance came to \$3 925 000 (see Fig. 1 and Table 1), which is 33% higher than the figure for 1969 (\$2 958 000) and is made up as follows:

- (a) UNDP(TA), \$1 134 000 in cash;
- (b) Income to Operating Fund II, including voluntary contributions of Member States transferred from the General Fund, \$1 749 000 in cash; and
- (c) Gifts in kind (services of cost-free and partly cost-free experts, Type II fellowships, training course stipends and grants of equipment in support of approved technical assistance projects) valued at \$1 042 000. Of this total, \$1 031 000 was made available in respect of the regular programme and \$11 000 for UNDP(TA) projects.

#### 2. UNDP(TA)

46. The funds allocated for carrying out the 1970 UNDP(TA) field programme included \$315 000 for regional and interregional projects and \$819 000 for country programme projects.

#### 3. Agency's regular programme

47. As at 31 December 1970, the pledges of voluntary contributions to the General Fund for 1970 had almost reached 84% (the highest percentage attained to date) of the target figure of \$2 million, as compared with 75% for 1969. Of the target figure, 97% was budgeted for technical assistance. The payment by Member States of current and prior years' pledges was reflected in the income to Operating Fund II (\$1 749 000, as compared with \$1 586 000 in 1969) from which the regular programme is financed.

#### 4. Gifts in kind

48. The estimated value of assistance in kind made available in 1970 was about \$1 042 000, which is 67% higher than the figure of about \$624 000 for 1969. This rise is attributable to substantial increases in the value of cost-free expert services (from \$14 400 to \$54 600), equipment grants (from \$80 200 to \$289 800) and fellowships (from \$528 800 to \$697 900; the latter includes Type II fellowship and training course stipends).

#### 5. Other available resources

49. In 1970 the Agency received allocations of \$666 000 for field projects financed by UNDP(SF).

50. Under funds-in-trust arrangements the Agency carried out one project in 1970, which involved the expenditure of \$2100.

6. Use of resources

51. The Agency provided more technical assistance in 1970 than in any previous year. The total value of the assistance, \$3 616 300, represents an increase of \$200 000 or 6% over 1969. The individual sums making up the 1970 total are \$1 619 300 under the regular programme, \$1 105 600 under UNDP(TA) and \$891 400 in assistance in kind; the regular programme and the assistance in kind totals are the highest on record for a single year. In addition, unliquidated obligations and assistance in kind outstanding at 31 December 1970 amounted to \$2 249 900, consisting of \$549 400 for expert services, \$421 600 for equipment and supplies and \$1 278 900 for fellowships. (The corresponding figures, broken down by source, are as follows: regular programme, \$1 269 400: \$455 600, \$279 900 and \$533 900; UNDP(TA), \$356 100: \$93 800, \$115 500 and \$146 800; assistance in kind, \$624 400: nil, \$26 200 and \$598 200.)

52. As in 1969, regular programme and UNDP(TA) cash expenditures and unliquidated obligations at year's end exceeded the cash resources in respect of 1970 projects financed under those two programmes. The explanation is that the 1970 figures include expenditures and obligations met from funds carried over from 1969 and prior years.

B. Distribution of assistance

1. By field of activity

53. A comparison is given below of the amount of assistance provided in the top five fields of activity in 1969 and 1970. Numerical data for all ten fields of activity are given in Figs 2A, 3A and 4A (which also include comparable data for 1969), in Fig. 5A and in Table 5.

Assistance by field of activity and type: 1969 and 1970  
(in thousands of dollars)

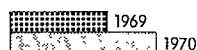
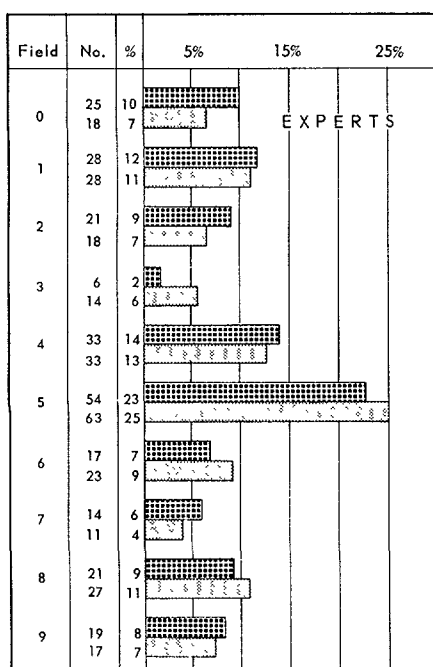
Field	Year	Experts	Equipment	Fellowships	Share of total programme	
		\$	\$	\$	\$	%
Application of isotopes and radiation in agriculture	1969	370.3	280.5	189.7	840.5	24.6
	1970	339.7	272.2	207.9	819.8	22.7
Nuclear engineering and technology	1969	230.6	39.3	248.1	518.0	15.2
	1970	234.7	148.3	255.7	638.7	17.7
Nuclear physics	1969	181.9	95.7	184.8	462.4	13.5
	1970	128.9	93.2	218.7	440.8	12.2
Other fields of application of isotopes and radiation	1969	96.7	164.7	41.2	320.6	8.9
	1970	139.0	136.9	118.3	394.2	10.9
Nuclear chemistry	1969	148.5	110.1	109.7	368.3	10.8
	1970	115.8	130.2	120.7	366.7	10.1
Total	1969	1028.0	690.3	773.5	2491.8	73.0
	1970	958.1	780.8	921.3	2660.2	73.6
Total assistance	1969	1376.8	882.8	1156.3	3415.9	100.0
	1970	1252.4	1055.6	1308.3	3616.3	100.0

**FIGURE 2A**  
**DISTRIBUTION OF EXPERT SERVICES BY FIELD OF ACTIVITY AND REGION: 1969 and 1970**

Field	Year	Africa		Americas		Asia and the Far East		Europe		Middle East		Inter-regional		TOTAL		Percentage of total	
		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
		0 - General atomic energy development	1969	2	2	-	-	1	1	1	5	1	1	20	2	25	7
	1970	4	5	2	6	3	3	-	-	-	-	9	2	18	16	7.1	2.4
1 - Nuclear physics	1969	6	31	6	26	6	19	7	18	3	15	-	-	28	109	11.8	13.9
	1970	3	16	9	29	2	4	4	9	1	3	9	3	28	64	11.1	9.7
2 - Nuclear chemistry	1969	1	4	5	25	6	28	6	17	3	16	-	-	21	90	8.8	11.5
	1970	-	-	6	21	8	31	4	18	-	-	-	-	18	70	7.1	10.6
3 - Prospecting, mining, processing of nuclear materials	1969	1	12	4	13	-	-	1	2	-	-	-	-	6	27	2.5	3.5
	1970	4	17	3	11	-	-	1	3	-	-	6	2	14	33	5.6	5.0
4 - Nuclear engineering and technology	1969	1	11	10	22	11	63	3	24	1	7	7	3	33	130	13.9	16.6
	1970	4	30	4	13	10	60	2	13	-	-	13	14	33	130	13.1	19.7
5 - Application of isotopes and radiation in agriculture	1969	10	63	7	37	15	69	10	19	2	12	10	7	54	207	22.7	26.4
	1970	15	90	3	16	11	40	10	16	2	13	22	8	63	183	25.0	27.7
6 - Application of isotopes and radiation in medicine	1969	5	21	3	16	3	23	4	7	2	13	-	-	17	80	7.1	10.7
	1970	1	2	3	10	2	4	2	6	2	14	13	6	23	42	9.1	6.4
7 - Application of isotopes and radiation in biology	1969	-	-	4	22	-	-	5	11	-	-	5	3	14	36	5.9	4.6
	1970	1	9	1	1	-	-	9	10	-	-	-	-	11	20	4.4	3.0
8 - Other fields of application of isotopes and radiation	1969	3	7	11	17	6	27	1	5	-	-	-	-	21	56	8.8	7.2
	1970	3	13	6	13	13	30	2	3	1	3	2	3	27	65	10.7	9.8
9 - Safety in nuclear energy	1969	1	3	5	28	1	2	1	1	1	1	10	6	19	41	8.0	5.2
	1970	4	10	10	21	-	-	2	2	1	5	-	-	17	38	6.8	5.7
GRAND TOTAL	1969	30	154	55	206	49	232	39	105	13	65	52	21	238	783	100.0	100.0
	1970	39	192	47	141	49	172	36	80	7	38	74	38	252 <sup>a/</sup>	661	100.0	100.0

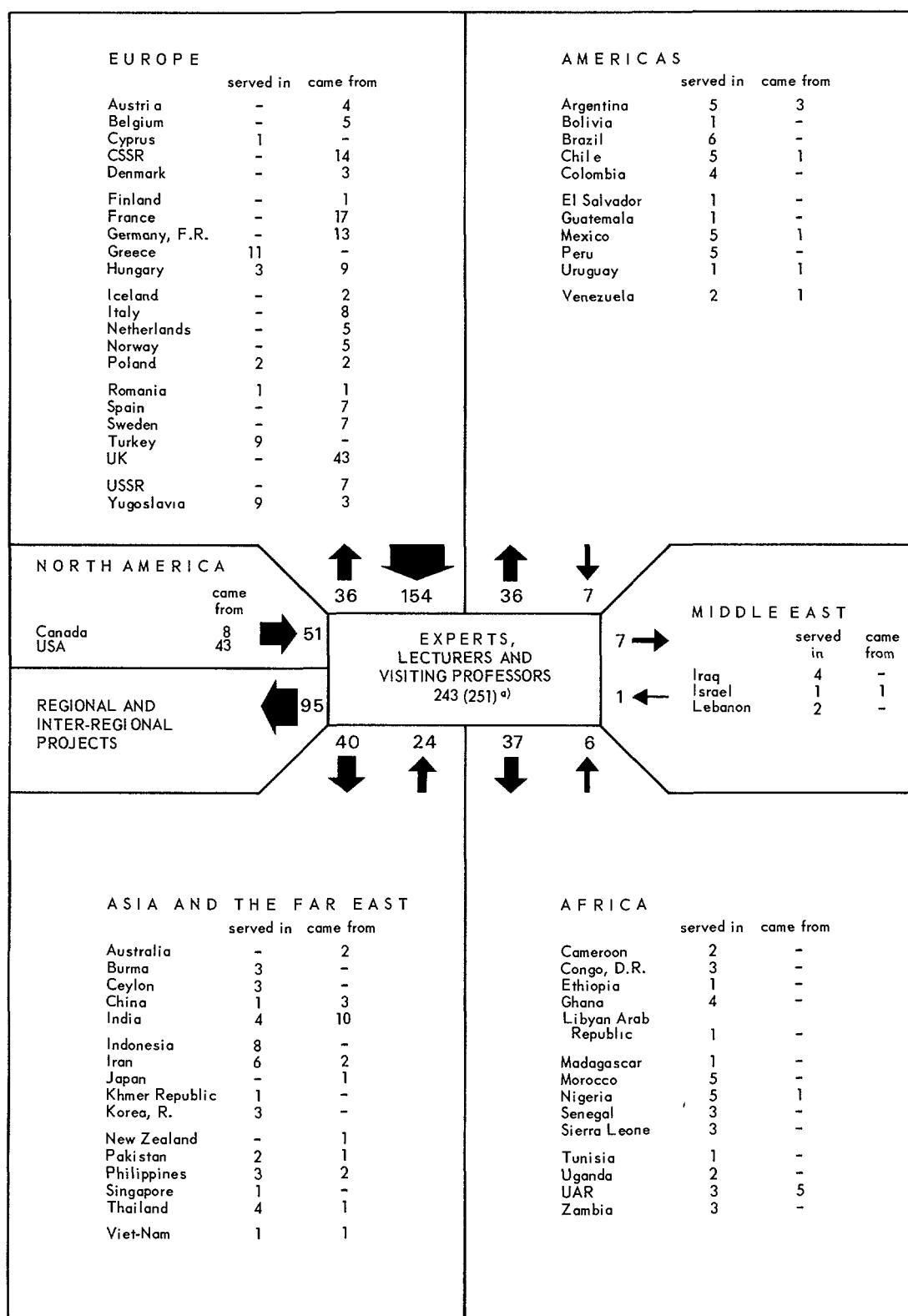
(1) Number of expert assignments. (2) Number of man-months.

a/ The difference between the number of assignments by field of activity (252) and by region (251; see Fig. 2B) is due to the fact that one expert served in two different fields of activity in the same country.



Note:  
 The figures in the second and third columns of the chart indicate the number of expert assignments and the corresponding percentage share, by field of activity, of total expert services provided.

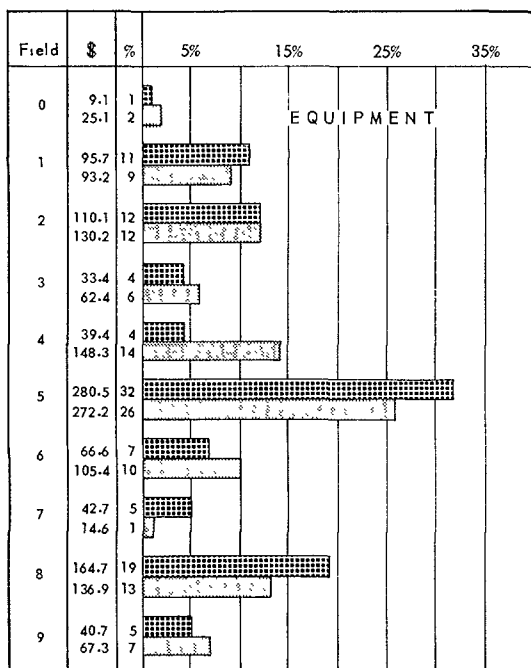
**FIGURE 2B**  
**DISTRIBUTION OF EXPERT SERVICES BY REGION: 1970**



<sup>a)</sup> The difference in the number of assignments (251) and the actual number of experts (243) is due to the fact that each of eight experts served in two countries.

**FIGURE 3A**  
**DISTRIBUTION OF EQUIPMENT BY FIELD OF ACTIVITY AND REGION: 1969 and 1970**  
(in thousands of dollars)

Field	Year	Africa	Americas	Asia and the Far East	Europe	Middle East	Inter-regional	TOTAL	Percentage of total
0 - General atomic energy development	1969	0.7	-	0.5	2.3	4.8	0.8	9.1	1.0
	1970	23.4	-	1.5	-	0.1	0.1	25.1	2.4
1 - Nuclear physics	1969	19.1	31.8	30.4	6.3	8.1	-	95.7	10.8
	1970	7.5	34.5	45.4	2.5	3.3	-	93.2	8.8
2 - Nuclear chemistry	1969	0.5	41.4	9.1	21.0	38.1	-	110.1	12.5
	1970	-	80.1	38.7	9.2	2.2	-	130.2	12.3
3 - Prospecting, mining and processing of nuclear materials	1969	2.5	30.4	-	0.5	-	-	33.4	3.8
	1970	13.0	31.7	-	7.6	-	10.1	62.4	5.9
4 - Nuclear engineering and technology	1969	6.0	17.7	13.1	-	2.4	0.1	39.3	4.5
	1970	59.5	16.3	40.1	-	14.5	17.9	148.3	14.0
5 - Application of isotopes and radiation in agriculture	1969	51.0	48.1	83.2	69.1	27.3	1.8	280.5	31.8
	1970	104.9	8.9	51.8	94.9	6.8	4.9	272.2	25.8
6 - Application of isotopes and radiation in medicine	1969	6.3	21.4	20.1	18.8	-	-	66.6	7.5
	1970	-	38.0	19.4	37.0	11.0	-	105.4	10.0
7 - Application of isotopes and radiation in biology	1969	-	3.8	-	37.1	-	1.8	42.7	4.8
	1970	1.1	10.3	-	3.2	-	-	14.6	1.4
8 - Other fields of application of isotopes and radiation	1969	14.4	32.7	62.1	18.1	13.0	24.4	164.7	18.7
	1970	3.0	53.2	36.2	44.5	-	-	136.9	13.0
9 - Safety in nuclear energy	1969	3.1	19.8	1.9	1.1	13.2	1.6	40.7	4.6
	1970	19.4	26.5	13.9	6.0	1.5	-	67.3	6.4
GRAND TOTAL	1969	103.6	247.1	220.4	174.3	106.9	30.5	882.8	100.0
	1970	231.8	299.5	247.0	204.9	39.4	33.0	1055.6	100.0



1969  
1970

Note:  
The figures in the second and third columns of the chart indicate the value (in thousands of dollars) of equipment and the corresponding percentage share, by field of activity, of the total equipment provided.

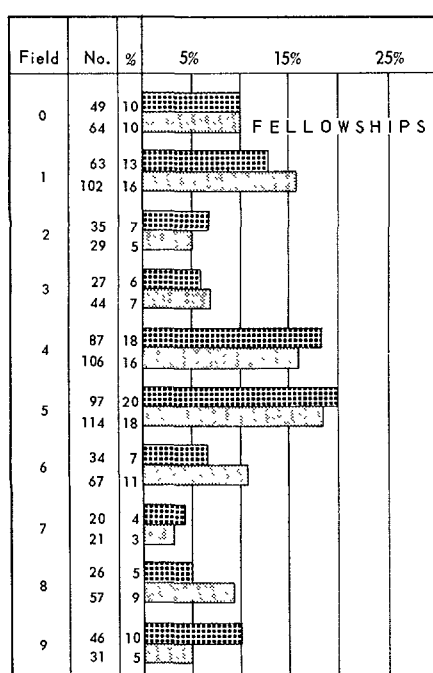


FIGURE 4A

DISTRIBUTION OF FELLOWSHIP AWARDS BY FIELD OF ACTIVITY AND REGION: 1969 and 1970

Field	Year	Africa		Americas		Asia and the Far East		Europe		Middle East		Inter-regional		TOTAL		Percentage of total	
		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
		0 - General atomic energy development	1969	-	-	1	8	16	12	-	-	-	-	32	13	49	33
	1970	6	54	1	3	21	49	1	3	-	-	35	15	64	124	10.1	3.2
1 - Nuclear physics	1969	6	67	8	81	10	109	34	315	5	36	-	-	63	608	13.0	21.1
	1970	11	117	23	150	10	92	33	352	1	12	24	9	102	732	16.1	18.9
2 - Nuclear chemistry	1969	5	57	9	88	5	49	16	126	-	-	-	-	35	320	7.2	11.1
	1970	3	18	6	66	8	84	10	105	2	24	-	-	29	297	4.6	7.7
3 - Prospecting, mining, and processing of nuclear materials	1969	1	10	15	37	1	9	7	30	3	36	-	-	27	122	5.6	4.2
	1970	2	15	2	24	7	48	3	24	1	12	29	54	44	177	6.9	4.6
4 - Nuclear engineering and technology	1969	9	85	10	93	30	267	18	136	7	80	13	17	87	678	18.0	23.5
	1970	7	51	12	133	34	333	23	206	5	58	24	72	105	853	16.5	22.1
5 - Application of isotopes and radiation in agriculture	1969	4	26	9	89	19	180	10	68	5	10	50	76	97	449	20.1	15.6
	1970	12	93	6	51	18	209	19	144	8	67	51	74	114	638	18.0	16.5
6 - Application of isotopes and radiation in medicine	1969	6	53	9	67	6	58	12	84	1	10	-	-	34	272	7.0	9.4
	1970	4	30	15	127	15	148	6	51	2	15	25	33	67	404	10.6	10.4
7 - Application of isotopes and radiation in biology	1969	1	6	1	8	1	12	4	33	1	1	12	16	20	76	4.1	2.6
	1970	4	29	2	20	9	99	4	38	2	24	-	-	21	210	3.3	5.4
8 - Other fields of application of isotopes and radiation	1969	3	13	15	36	5	42	2	16	1	12	-	-	26	119	5.4	4.1
	1970	1	6	8	50	19	59	9	85	2	22	18	26	57	248	9.0	6.4
9 - Safety in nuclear energy	1969	-	-	2	24	9	98	6	50	1	12	28	26	46	210	9.5	7.3
	1970	1	12	14	22	9	96	3	13	4	42	-	-	31	185	4.9	4.8
GRAND TOTAL	1969	35	317	79	531	102	836	109	852	24	197	135	148	484	2887	100.0	100.0
	1970	51	425	89	646	150	1217	111	1021	27	276	206	283	634	3868	100.0	100.0

(1) Number of fellowship awards. (2) Number of man-months.

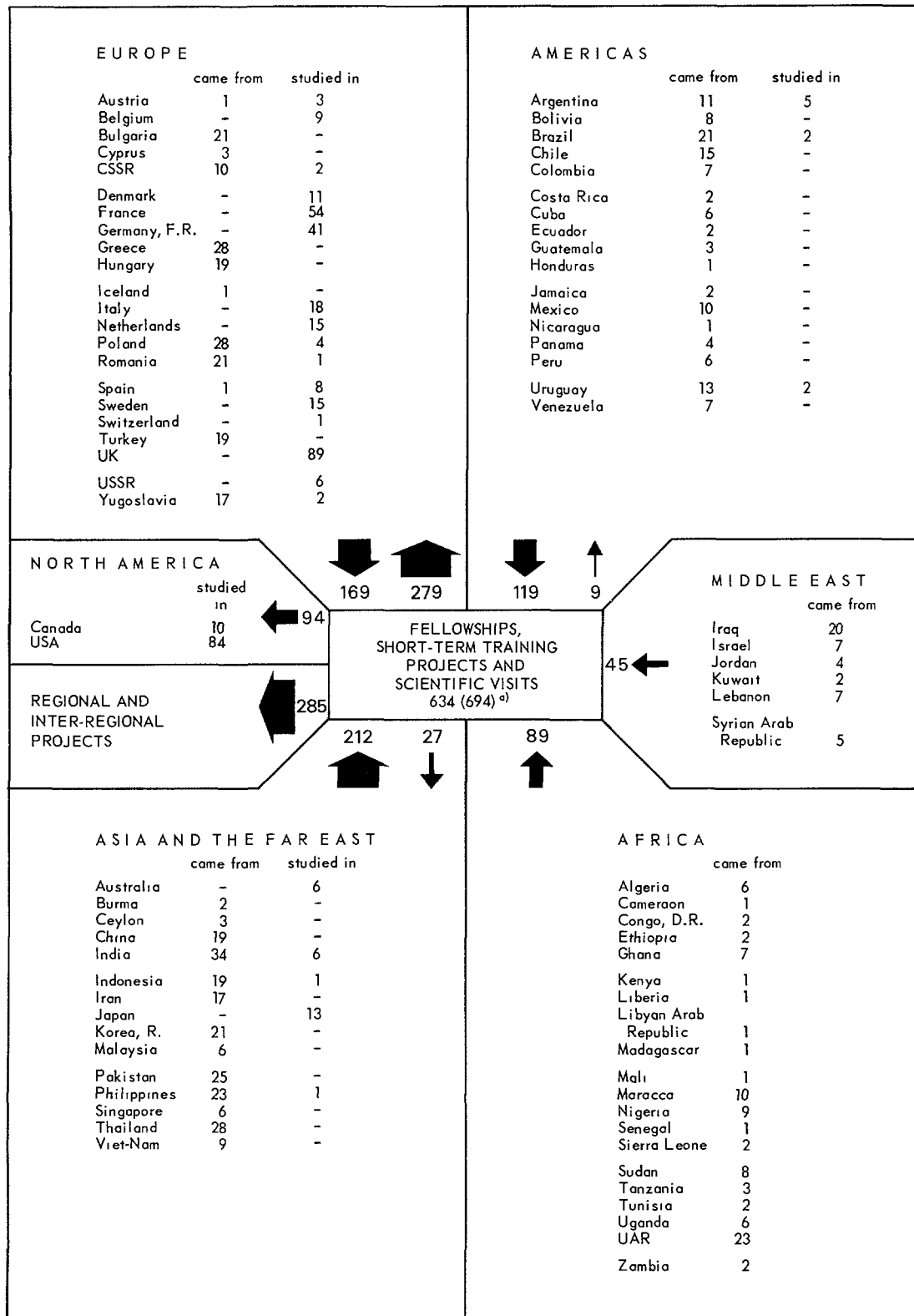


1969  
1970

Note:  
The figures in the second and third columns of the chart indicate the number of fellowship awards and the corresponding percentage share, by field of activity, of the total number of fellowships awarded.

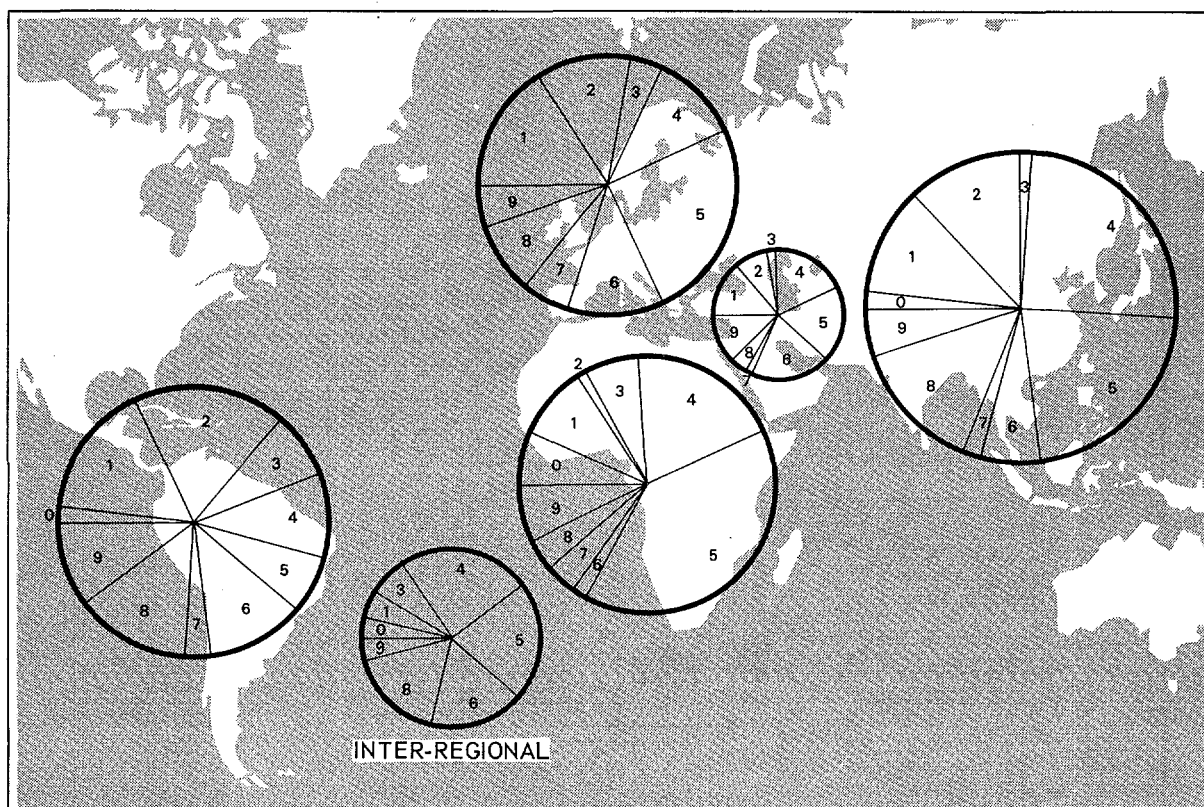


**FIGURE 4B**  
**DISTRIBUTION OF FELLOWSHIP AWARDS BY REGION: 1970**



a) The difference between the number of awards (634) and the number of places of study (694) is due to the fact that eleven fellows studied in two, five in three, one in four, one in five and one in six different countries, whereas four holders of an award for scientific visits went to two, four to three, and five to four different countries.

**FIGURE 5A**  
**DISTRIBUTION OF TECHNICAL ASSISTANCE BY FIELD OF ACTIVITY AND REGION: 1970 <sup>a)</sup>**

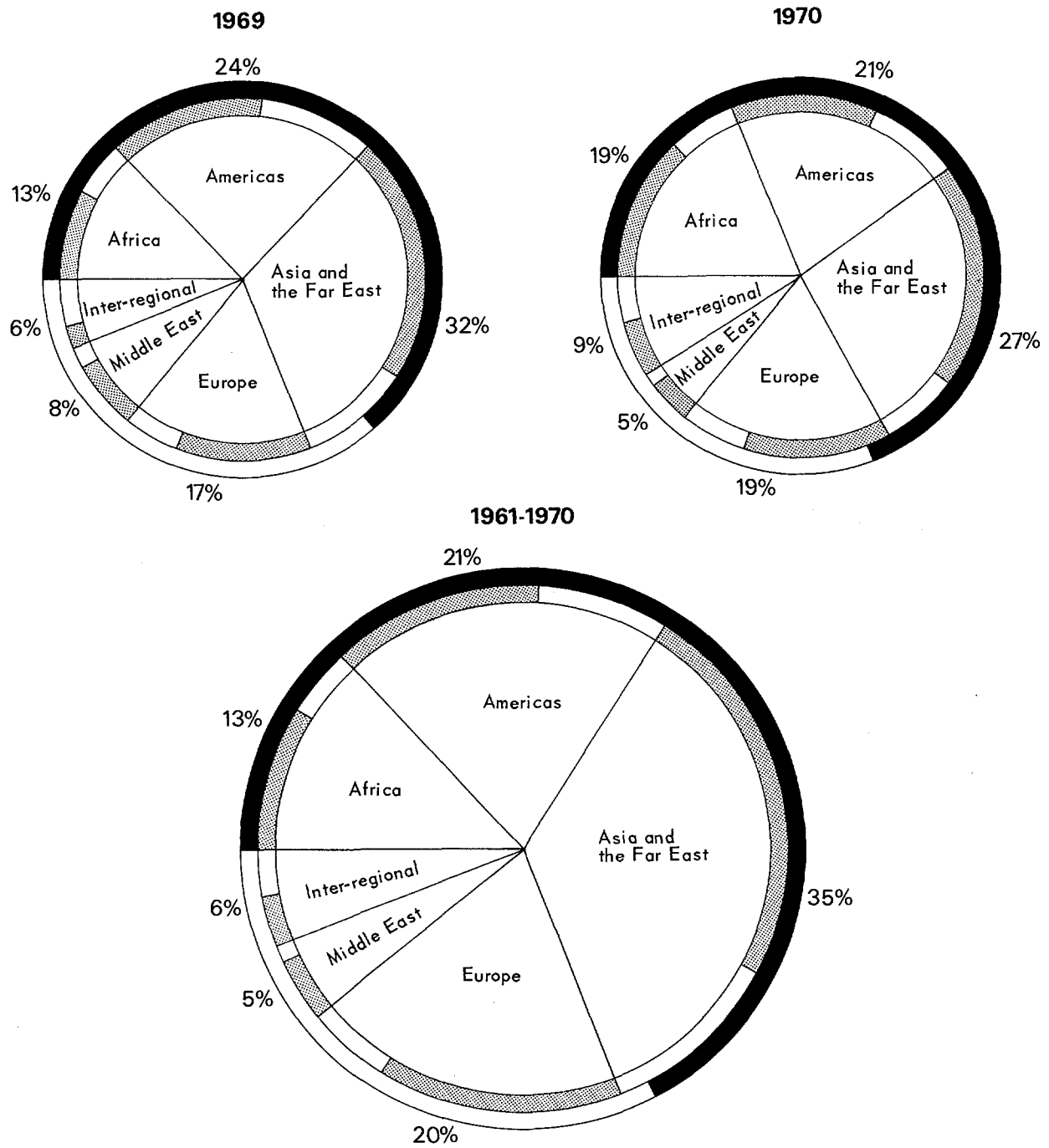


**SUMMARY**

Field	Africa %	Americas %	Asia and the Far East %	Europe %	Middle East %	Inter- regional %
0- General atomic energy development	7	2	2	-	-	4
1-Nuclear physics	9	16	11	16	14	5
2-Nuclear chemistry	1	18	12	12	8	-
3- Prospecting, mining and processing of nuclear materials	7	8	1	4	2	7
4-Nuclear engineering and technology	19	10	25	11	20	24
5-Application of isotopes and radiation in agriculture	40	7	22	25	19	22
6-Application of isotopes and radiation in medicine	2	12	6	12	20	17
7-Application of isotopes and radiation in biology	4	3	2	6	1	-
8-Other fields of application of isotopes and radiation	4	14	14	9	4	17
9-Safety in nuclear energy	7	10	5	5	12	4
	100%	100%	100%	100%	100%	100%

<sup>a)</sup> For each region, the relative monetary value of the technical assistance provided by the Agency is denoted by the size of the circle superimposed over the region on the map. The size of the segments in each circle indicates the share of total assistance given in the various fields of activity.

**FIGURE 5B**  
**DISTRIBUTION OF TECHNICAL ASSISTANCE BY REGION AND SOURCE**  
 (1969, 1970 and 1961-1970)

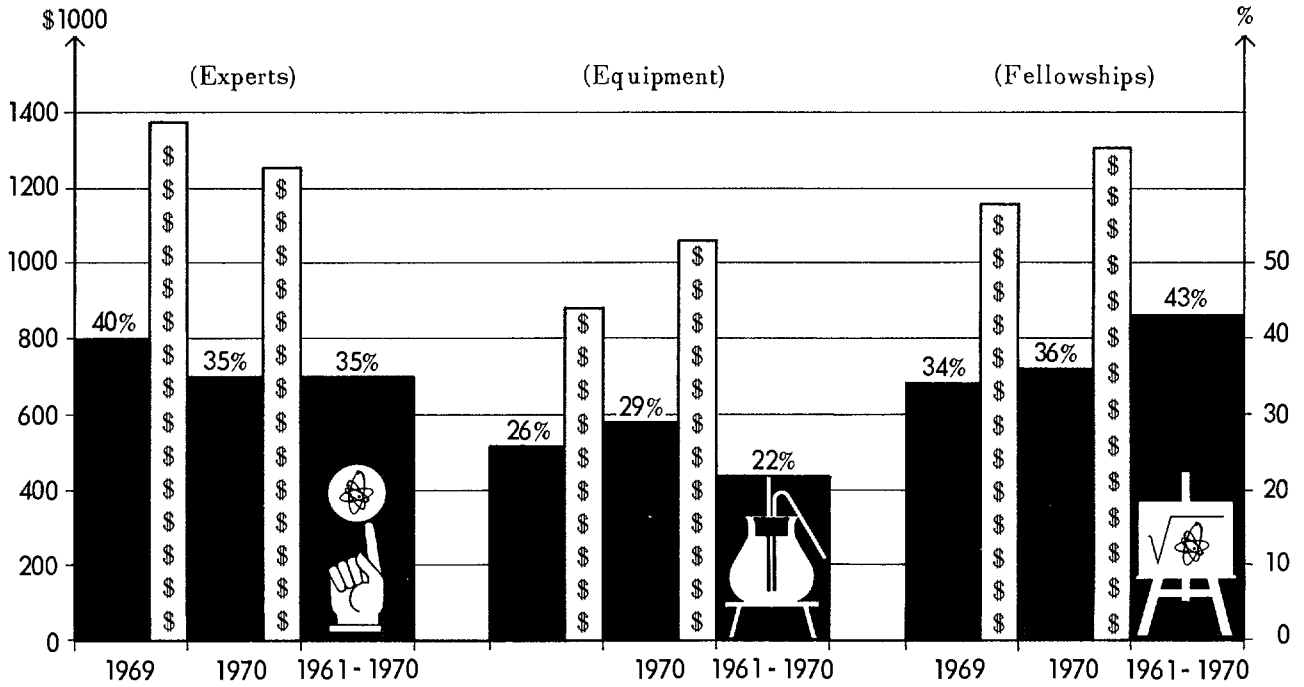


LEGEND (distribution of technical assistance by source):

INNER RING	(regional distribution)
	Regular programme
	EPTA-UNDP(TA)

OUTER RING	(overall distribution)	1969	1970	1961-1970
	Regular programme	63.7%	69.1%	67.3%
	EPTA-UNDP(TA)	36.3%	30.9%	32.7%

**FIGURE 6**  
**DISTRIBUTION OF TECHNICAL ASSISTANCE BY TYPE OF ASSISTANCE**  
 (1969, 1970 and 1961-1970)



	1969		1970		1961 - 1970	
	%	\$1000	%	\$1000	%	\$1000
EXPERTS	40	1376.8	35	1252.4	35	9351.7
EQUIPMENT	26	882.8	29	1055.6	22	5705.9
FELLOWSHIPS	34	1156.3	36	1308.3	43	11332.9
<b>TOTAL</b>	<b>100</b>	<b>3415.9</b>	<b>100</b>	<b>3616.3</b>	<b>100</b>	<b>26390.5</b>

Note: Fellowships include participants in short-term training projects.

## 2. By region and country

54. Detailed information on the distribution of technical assistance by region is given in tabular form in Figs 2A, 3A and 4A and summarized in Figs 5A and 5B. It will be noted that the largest variation shown in Fig. 5B is the sizable increase in the assistance provided to countries in Africa, from 13% of the total assistance in 1969 to 19% in 1970; there was a corresponding reduction in the assistance provided to countries in Asia and the Far East, from 32% of the total assistance in 1969 to 27% in 1970; the other percentage variations did not change by more than 3%.

55. In 1970, 68 countries received technical assistance from the Agency, as compared with 65 countries in 1969. Including those which acted as hosts for short-term training projects and scientific visits, 29 countries both received and provided assistance in 1970 (24 in 1969). Compared with 18 in 1969, 19 countries provided but did not receive technical assistance in 1970, and 35 countries were recipients only (41 in 1969). Thus, as in 1969, 83 countries participated in the Agency's technical assistance programme in 1970. Figs 2B and 4B and Table 3 show the extent to which skills and knowledge were exchanged between countries.

## 3. By type of assistance

56. As shown in Fig. 6, the distribution of technical assistance in 1969, 1970 and over the period 1961-1970, by type, was as follows:

<u>Period</u>	<u>Experts</u>	<u>Equipment</u>	<u>Fellowships</u>
1969	40%	26%	34%
1970	35%	29%	36%
1961-1970	35%	22%	43%

### (a) Experts, lecturers and visiting professors

57. In 1970, 243 experts, lecturers and visiting professors from 39 countries served a total of 661 man-months at a cost of \$1 252 400; the comparable data for 1969 were: 230 experts, lecturers and visiting professors from 36 countries provided 783 man-months of assistance at a cost of \$1 376 800. In addition, unliquidated obligations and assistance in kind outstanding at 31 December 1970 totalled \$549 400 for expert services. Eight experts each served in two countries and 148 experts were assigned to only one country; a total of 48 countries (53 in 1969) were provided with country programme experts and visiting professors, and an additional 95 experts and lecturers (66 in 1969) assisted 16 regional and interregional projects (34 partly cost-free and 23 cost-free experts and lecturers were provided, as compared with 18 partly cost-free and 13 cost-free experts and lecturers in 1969).

### (b) Equipment and supplies

58. Including the value of grants of equipment delivered during 1970, 53 countries and nine regional projects (51 and nine, respectively, in 1969) were provided with equipment and supplies to a value of \$1 055 600, which represents an increase of about 20% over the amount of \$882 800 provided in 1969 and is the largest amount of equipment provided by the Agency in any one year. An additional amount of equipment and supplies valued at \$421 600 was still outstanding at the end of the year; this amount is included in the figures given in columns (9) and (10) of Tables 4, 7 and 8.

59. As in previous years, efforts were made to spread the purchases of technical assistance equipment and supplies over a large number of Member States. In 1970, these items were procured in 21 countries (see Fig. 3B, which also includes financial data in respect of equipment grants), as compared with 22 countries in 1969.

60. The Agency is criticized at times for providing not commonly-known makes of equipment. The explanation for this is fairly simple: if it is not essential that a certain make be provided, then procurement action is based on competitive bidding in accordance with the Agency's financial regulations, due regard being given to the necessity of utilizing all the available currencies - received from UNDP and in the form of Member States' voluntary contributions to the General Fund. With regard to supplying specific makes of equipment, the special wishes of requesting countries were taken into account to the extent possible, especially where this facilitated the installation, operation and maintenance of the equipment requested.

61. Spare parts and expendable supplies required for equipment have also been provided in the past, either as a part of the equipment element of approved projects, or in connection with the expert's assignment when the spare parts or expendable supplies were required for the execution of the project. The Agency has been asked to consider the possibility of establishing a regular spare parts supply service. In view of the large range of equipment concerned, however, such a supply service would be impracticable and very costly.

62. Considering the amount of capital invested in scientific equipment in the developing countries and the loss to the economy if this equipment is not in operational order, a satisfactory solution to the associated problems of equipment servicing and spare parts procurement is urgently required. To begin with, servicing arrangements for scientific equipment - regardless of the type or make - are not very satisfactory in the developing countries, usually because there are not enough equipment items of a given manufacturer in the area to make good equipment servicing economically feasible. Then, spare parts may be difficult to obtain, because, if ordered from the equipment manufacturer, payment may have to be made in foreign currency - and there may be restrictions on the use of such currency, plus unavoidable delay in making the necessary arrangements.

63. The magnitude of the problem demands thorough planning and concerted action. Firstly, the recipient countries should train more instrumentation technicians and set up additional workshops for the maintenance and repair of electronic equipment. (Furthermore, given adequate facilities and a supply of standard components, these technicians could also assemble some equipment for which scarce foreign currency is now required.) Secondly, Governments should encourage local representatives of equipment manufacturers to improve their servicing capability and their stock of spare parts. Thirdly, where spare parts are not available locally, and foreign currency is scarce, it would be best to locate alternative sources of supply of spare parts in countries which will accept the currency that is readily available. Also, it should not be overlooked that many spare parts, like electron tubes (valves), semi-conductors and standard components, are interchangeable, that is, can be used in numerous items of equipment and need not necessarily come from the manufacturer of a certain piece of equipment; in many cases the manufacturer has not fabricated all of the relevant parts used, but also relies on outside sources of supply.

64. When equipment lists are drawn up for submission to the Agency, the requesting authority should - as matter of routine - determine whether the selection of certain equipment items would involve problems with regard to maintenance or the supply of spare parts and any expendable supplies required therefor. Where problems of this kind are likely - irrespective of whether the item of equipment is of a highly sophisticated nature or not - it would be advisable to consider the potential expense of equipment operation and maintenance, which must be borne by the recipient country, before deciding on the list of equipment to be requested.

#### (c) Fellowships

65. A total of 634 candidates from 68 countries received fellowship awards under the training programme in 1970 (see Fig. 4B and Tables 3 and 6) as against 484 candidates from 58 countries in 1969. The number of man-months of training awarded was 3868 in 1970 as against 2887 in 1969. Although more country programme and Type II awards had been made in two earlier years, namely in the early 1960s when a number of nationals from advanced countries also participated in the fellowship programme, the total number of 634

participants in 1970 is 100 more than recorded for what was formerly the best year. This high figure is due primarily to the large increase in the number of participants in short-term training projects (from 190 award holders in 1969 to 278 in 1970) and to the sizable increase in Type I country programme awards (from 118 in 1969 to 159 in 1970). There was a modest increase in the number of Type II and UNDP(TA) country programme awards (from 146 and 30, respectively, in 1969 to 163 and 34 in 1970). As can be seen in the table below, the number of country programme awards rose by some 20% and those for short-term training projects by nearly 50%. It is also interesting to note that, for the first time in the history of the Agency's fellowship programme, the percentage of nominations which led to effective awards exceeded 70%.

66. The value of the training provided by the Agency in 1970, namely, \$1 308 300 (\$1 156 300 in 1969), is also the highest amount on record for any one year. This amount does not include the unliquidated obligations and assistance in kind outstanding (Type II training not yet completed, or not yet begun) as at 31 December 1970, amounting to \$1 278 900. This amount is nearly \$300 000 higher than the combined total of these two items at the end of 1969 and holds promise of a training programme likely to reach \$1 500 000 in 1971.

67. A comparison of the nominations and awards for country programme fellowships in 1969 and 1970 and of all awards made during those two years is given below. (The data relating to the 1969 country programme awards given below and in the chart following paragraph 32 above, which reflects the status of these awards as at 31 December 1970, will show that the withdrawal rate after the closing of the programme year is about 7%. The data on the 1969 effective awards given below were not up-dated, so that the same period - the programme year - could serve as a basis for comparison.)

<u>Country programme awards</u>	<u>1969</u>	<u>1970</u>
Nominations received	448	499
Effective awards [ 7 ]		
Individual projects	283	345
International projects	11	11
Percentage of nominations which led to effective awards	65.6%	71.3%
<u>Other international training awards</u>		
Scientific visits	13	15
Short-term training projects	177	263
Total number of awards	484	634

(d) Regional and interregional activities [ 8 ]

(i) Short-term training projects

68. In 1970, the Agency conducted 19 regional and interregional training projects in 31 different countries, in which there were about 900 participants from 71 different countries. The cost of attendance of 293 participants was paid out of project funds (Agency resources in kind, under the regular programme and under UNDP(TA) covered the cost for 263 participants from 60 countries, the cost for 14 participants from as many countries was met from FAO's UNDP(TA) allocation, and the cost of participation of 16 fellows from nine countries was financed from UNDP(SF) project funds); the cost of attendance of 602 participants, including 571 nationals of host countries, was borne by another organization or

[ 7 ] Total number of awards less withdrawals after award as at 31 December 1969 and 31 December 1970, respectively.

[ 8 ] Regional and interregional projects are listed in Annex II.

programme or by the participant's Government. The statistical figures and tables in this report include short-term training project data only in respect of the 263 awards financed from Agency resources, which included resources in kind that were used to meet the entire cost of one training course.

69. Ten of the 19 regional and interregional training projects related to the application of isotopes and radiation (six in agriculture, two in medicine and two in industry); in addition, there were three "general atomic energy development" projects, two in radiation protection, and one each in the maintenance and repair of nuclear electronic equipment, nuclear techniques in the mining industry, reactor physics, and uranium ore analysis. Further details on the location, attendance, financing, etc. of these projects are given in Annex II.

(ii) Follow-up missions

70. In 1970 five one-man missions were sent to the regions to determine needs and discuss development plans with requesting countries. The cost of sending staff members on these missions averaged \$198 for each of the 33 countries visited. As indicated in paras 13 and 16 above, the new UNDP programming procedures will probably necessitate the participation of Agency staff members in the first round of country programming exercises, when the nature of the assistance to be provided by UNDP over the following 3-5 years will be worked out in meetings to be held in each recipient country. The frequency and cost of follow-up missions must, inevitably, be expected to increase significantly over the next five years.

C. UNDP(SF) activities

71. Field operations in respect of the project in Central America to study the feasibility of eradicating the Mediterranean fruit fly by use of the sterile-insect-release method were continued beyond 30 June to 31 December 1970. It was decided not to embark on a large-scale eradication experiment in a second phase at present. The research work at this location is being continued on a very limited scale in 1971 with UNDP(TA) regional project financing.

72. The only other Agency-executed UNDP(SF) project that was operational in 1970 - on the application of nuclear research techniques in agriculture in India - made exceedingly good progress. In spite of the inherent difficulties of co-ordinating the research efforts of four institutes (the Indian Agricultural Research Institute, New Delhi, the Bhabha Atomic Research Centre, Trombay, the Indian Veterinary Research Institute, Izatnagar, and the National Dairy Institute, Karnal) - involving diverse operating locations - the enthusiastic co-operation between the counterparts, Government and locally-based UNDP officials, and Agency experts has resulted in a project which is a credit to all concerned. It is expected that the new laboratory being constructed at New Delhi, to be used for some of the research undertaken in connection with this project, will be commissioned in 1971.

73. At its regular session in June 1970 UNDP's Governing Council approved two new large-scale projects to be executed by the Agency. Both projects involve exploration for uranium; one project will be in Greece (in which exploration will be concentrated on areas in Central and Eastern Macedonia and Thrace), and the other in Pakistan (here field operations will be carried out in the Siwalik sandstones in the Dera Ghazi Khan district of West Pakistan). The expected duration of the two projects is one and a half and two years, respectively. Field operations are scheduled to begin in 1971. As mineral resources are involved, these projects will be carried out in association with the United Nations.

74. A number of proposals for new large-scale projects to be executed by the Agency is under active consideration, and it is highly probable that three of these will be approved by UNDP's Governing Council at its regular session in June 1971. In addition to its other technical co-operation activities, the Agency assisted seven UNDP(SF) projects in 1970, as a sub-contractor providing isotope hydrological advisory services and making water analyses, at a reimbursable cost of about \$12 000 (see Annex III).



## D. Evaluation of the technical assistance programme

### 1. General

75. Pending the completion of the review by the appropriate bodies of ECOSOC of the organizational structure of UNDP and other topics of immediate importance for economic and social development, ECOSOC did not in 1970 consider the evaluation of technical assistance programmes of United Nations organizations. The Inter-Agency Study Group on Evaluation, on which the Agency is represented, is to continue its work and it is expected that it will meet and that ECOSOC will resume its consideration of the evaluation of technical assistance programmes in 1971.

76. The United Nations organizations continued to evaluate their own programmes of assistance and, where appropriate, assisted the national authorities in assessing the impact that they were making on national and regional development. In the Agency, project evaluation is an integral part of the procedures followed in project preparation, appraisal of requests, operational control and assessment of results. When a request for assistance is received, the Secretariat evaluates the project in question in the light of the Government's economic and social development plans and the technical feasibility of the use of nuclear techniques. Where appropriate, further clarification is sought by correspondence, in meetings with Government representatives or, exceptionally, by sending consultants or Headquarters staff to the country concerned. At the initial stage, therefore, the project is subjected to the closest scrutiny from the technical and the economic standpoint. During implementation of the project, operational control is maintained through the reporting procedures followed by Agency technical assistance experts and visits by scientific and management staff members from Headquarters, thus ensuring that the project is continually reviewed in order to determine the extent to which it is fulfilling the stated aims of Government policy and to establish whether it should continue to be given priority; the conclusions to be reached are indicated to some extent by the counterpart contribution in personnel and facilities provided for the expert and by the financial contributions made by the Government during the period of the project. This procedure is particularly appropriate in the case of long-term projects, which usually form part of larger development programmes carried out in co-operation with the Government. Since most Government development plans are subject to annual review in connection with the subsequent year's budget, these development programmes are in turn automatically subject to Government review at regular intervals, usually not exceeding one year. The reviews by the Government during the implementation of a project are normally carried out with the participation of the technical assistance expert (or at least his comments are sought) and the UNDP Resident Representative or his alternate. On completion of his assignment, the expert is instructed by the Agency's Secretariat to ensure that his final report to the Government reflects his experience of local conditions and possibilities. At the debriefing stage, including discussions of the expert's draft final report, the Secretariat's knowledge of current developments in nuclear techniques is used to good effect in arriving at conclusions and making recommendations for further action by the Government. This is done in a practical manner so as to ensure that proper use is made of the international aid provided and that the Government's technical services will, where appropriate, be able to continue the programme started.

77. Bearing in mind the high probability that further aid will be sought from the Agency, either in the form of technical assistance experts and equipment or consultant services in the more sophisticated disciplines leading, for example, to the introduction of nuclear power, it is essential that the Agency should keep itself informed of the existing position in recipient Member States. The process of evaluation in the technical assistance programme, irrespective of the source of funds, is continued after the termination of assistance; a Government's atomic energy programme in economic development and its scientific programme are kept under review through consultation with Government representatives, usually during the sessions of the General Conference, the dispatch of follow-up missions and so on. Most technical assistance projects are part of a larger development project or scientific programme; requests are, therefore, automatically, evaluated on receipt in the light of any previous aid given by the

Agency and follow-up action by the Government on the recommendations of previous experts assigned for work in the same or similar fields of activity. This is particularly the case in respect of demands for equipment. Sometimes equipment has been provided to an institute or to a technical service unknown to the Government's requesting service, and in such cases the use of the available equipment by the different bodies concerned must be ensured. Steps are also taken with regard to requests for fellowship training to ensure that there will be an established post available for the fellow on his return from training.

78. Evaluation of the impact of the Agency's technical assistance programme at the national level of economic and social development is basically a Government obligation. On the other hand, the efficacy of the Agency's aid for a Government programme can often be assessed by determining whether the original objectives of that aid were achieved by the time it was terminated. In making such an assessment, it must be borne in mind that the effective implementation of a project is dependent on many factors, in particular the continuing availability and efficiency of Government counterpart personnel, the adaptability of the Agency expert to his new environment, the delivery of equipment at the appropriate time, its maintenance and the provision, where required, of spare parts including the necessary foreign exchange for their purchase, and the continued allocation of priority to the project's objectives in the national programme. There have been cases in which some or all of these requirements have not been fully met, but on the whole the recipient Governments continued in 1970 to express satisfaction with Agency aid.

79. Assessments of projects in Cameroon, Chile, Indonesia, Iran, Peru, Sudan and Thailand, which are set out below, indicate the difficulties encountered in implementing multilateral aid, according to procedures which meet the wishes of the Agency, UNDP and recipient Governments, and the results of continuous day-to-day management by the Secretariat and the daily field work of the expert.

## 2. Applications of radioisotopes in agriculture in Cameroon

80. The main objectives of the project are the introduction of the use of radioisotope techniques in the curriculum of the Ecole Fédérale Supérieure d'Agriculture (EFSA), the integration of such techniques in the study of relevant agricultural problems in Cameroon and in neighbouring countries, the training of local technicians, who will act as agricultural extension workers in the theoretical and practical applications of nuclear techniques, and the co-ordination of agricultural research work involving the use of nuclear techniques in Cameroon.

81. To meet these objectives the Agency provided the services of an agricultural expert and appropriate equipment valued at \$9000; the expert took up duty in January 1969. His first task was to install the equipment and make it operational, carry out an appraisal of the situation and draw up a detailed programme of work. In collaboration with the Government's technical services, he assisted in planning a radioisotope laboratory, with provision for radiation protection; work on the building started in 1969 with a Government contribution of some \$30 000. The expert has also been able to secure substantial funds from the Government for the purchase of laboratory equipment and has established health and safety regulations for radioisotope workers. In order to improve and expand the library facilities, a documentation centre was started and it is now stocked with about 100 books on the basic principles of nuclear techniques and use of radioisotopes in agriculture.

82. The expert, as part of the co-ordination process, has contacted the various departments in EFSA, the science faculty of the Federal University and the different research institutes in order to formulate an integrated programme on radioisotope applications to deal with agricultural problems, taking into consideration the present availability of resources and trained personnel and the economic importance of each problem arising in work already undertaken in other countries so as to avoid unnecessary duplication of effort. The programme of work is as follows:

(a) Function of water in the growth of plants

Here emphasis is placed on the use of neutron moisture probes in soil/water studies and the training of young technicians in the efficient uses of this technique. In collaboration with l'Institut de Recherches Agronomiques Tropicales et des Cultures Vivrières (IRAT) work on the "Karé" and "Harde" soils is now in progress with a view to improving their agricultural productivity;

(b) Applications of mineral fertilizers

In order to achieve an increase in crop yields, a programme involving the use of labelled fertilizers, such as phosphorus, is being implemented, with emphasis on fertilizer placement methods, time of application and investigation of uptake mechanism by crops. In this case, the expert is also working closely with the agricultural department of EFSA and IRAT on a comparative study of fertilizer response in different soil types;

(c) Fungicide studies

In co-operation with the Institut Français du Café et du Cacao and the Hoechst Company, studies on all aspects of fungicide on cocoa, involving the use of labelled isotopes, have started. The expert is also investigating the efficiency of insecticides for the protection of stored maize, and the metabolism of certain mineral elements in relation to the problem of animal nutrition.

83. The expert is also investigating the extent to which the available radioisotope laboratory resources could be used to expand the training aspects of the project, especially for chemical and soil analysis and laying the foundation for future agricultural research work in EFSA. He has already trained his counterpart in the basic principles of the use of radioisotope techniques in agriculture; the latter is now on an Agency fellowship abroad and on his return will take over the work of the laboratory from the expert. The expert will continue his assignment under the regular programme until the end of 1971, by which time the use of nuclear techniques should be fully integrated into the agricultural development programme of Cameroon.

3. Soil humidity measurements in Chile

84. The main agricultural part of Chile is the central region, which is a long narrow strip between the Cordillera and the Pacific Ocean with very poor soils. A major problem is the irregularity of water supply, both in irrigated fields and in non-irrigated pasture areas. A request for assistance was submitted to the Agency in 1967 with a view to starting studies of soil moisture and soil density, involving the use of neutron probes and other nuclear instruments, in order to help establish adequate systems for irrigation management and a better selection of crops most suitable to the local conditions. The request originated in Government offices, and not in the National Nuclear Energy Commission, which was at that time being organized.

85. The Agency approved a project under the 1968 regular programme and provided an expert for 12 months and some equipment. There were some worries at that stage in regard to internal co-ordination between different ministries and offices in Chile and the adequacy of counterpart support. It was known, however, that an effort was being made to improve internal co-ordination and it was also realized that the personality of the expert chosen would be an important factor in achieving the aims of the project.

86. The Agency was fortunate in obtaining an expert who, in addition to his excellent technical qualifications and experience, proved to be very capable in adapting his work to conditions entirely different from those prevailing in the advanced research centre from which he came. He was instrumental in establishing close collaboration between nuclear energy, agricultural and university research groups and also in arranging for close contact and the exchange of results with the participants in a UNDP(SF) project on soils being implemented by FAO. The expert had to face difficulties in the conditioning of the equipment provided by the Agency, and with the help of a local electronics technician he developed a battery with an ad hoc electronics system which might prove an excellent solution for similar problems with portable power sources in other developing countries.

87. In a very systematic way five different studies were started under the expert's supervision, covering different soils, crops and irrigation conditions - or lack of irrigation. The results obtained, while of relatively small significance from a statistical point of view since they cover a one-year cycle only, have provided basic information on a series of factors which, after further investigation, can be of the greatest importance in increasing agricultural production in the country. Moreover, they have demonstrated the need and usefulness of such studies, and the Government has taken the necessary measures to ensure a continuation of the expert's work, including the appointment of new scientific personnel. It is expected that these studies will gradually be extended to cover a larger part of Chile's central valley.

88. As a result of this project it has also been found that it might be necessary to establish the age of some underground aquifers, for which isotope techniques might be needed. The findings of the expert were also of use in studies on eventual disposal of low-level liquid radioactive wastes from the new Nuclear Research Centre near Santiago, which were being conducted with the assistance of another Agency expert.

#### 4. Industrial radiography in Indonesia

89. Until recently the only apparent industrial radiographic work being done in Indonesia was confined to the oil industry and construction projects carried out by foreign-based companies. There was no resident company or agency prepared to do such work, which is considered a vital requirement in large-scale construction and industrial development.

90. In 1969-1970 the Agency provided assistance to the Indonesian National Atomic Energy Authority (BATAN) in a project to establish an industrial radiography facility at the Pasar Djumat Research Centre. Twelve months of expert services and some radiographic equipment were provided. The project's aims were:

- (a) The training of local personnel in relevant radiographic techniques;
- (b) The design of facilities and modification of existing facilities for radiography; and
- (c) The promotion of radiographic techniques among representatives of private and Government industries.

The first step was the establishment of a small, homogeneous and dedicated group at BATAN which obtained intensive training and practical experience and, at the same time, every effort was made to improve the facilities of the group. As soon as the group and its facilities were functioning smoothly, promotional activities were initiated, consisting of lectures on and demonstrations of radiographic techniques for industrial representatives in the Djakarta area, followed by visits to major industrial centres in Java, where the application of the new techniques with a view to solving some specific problems of each industrial concern was demonstrated.

91. The response to these efforts was enthusiastic and many requests were received from individuals, as well as industrial concerns, either for additional information and guidance in starting their own programmes or for assistance in tackling specific problems which they were

facing. These requests came not only from larger concerns but also from small enterprises which, realizing the potentialities of the new techniques, made arrangements to maintain close contact with the group at Pasar Djumat in order to be able to use its services.

92. As a result of the group's demonstration work in various parts of Java, representatives of the National Power Company learned of its activities and invited it to bid for a contract for the radiographic inspection of a power plant being built by a Yugoslav firm in Makassar, Sulawesi. The contract was awarded to the BATAN group and approximately three months were spent in radiographing over 2000 pipe welds in the high-pressure furnace and boiler systems. The contract for the Makassar plant made it necessary, and also possible through the funds earned, to obtain more radiographic equipment and supplies and, what was more important, it provided an excellent opportunity for the group to acquire experience during the expert's tour of duty. An identical power plant being built at Palembang, Sumatra, will require similar inspection and it is expected that this will also be done by the BATAN group.

93. The establishment of this industrial radiography group will not only result in some savings of foreign currency for services that would otherwise have to be provided from outside the country, but will also enable BATAN to contribute significantly to the country's industrial industrialization programme.

#### 5. Use of radioisotopes in hydrology in Iran

94. The Government requested technical assistance in the establishment of a laboratory and the initiation of studies on the uses of isotope techniques in hydrology. The project was included in the 1967 regular programme under which provision was made for nine months of expert services, together with a part of the equipment - at an estimated cost of \$17 000 - required for work with radioisotopes in hydrology, with tritium and carbon-14.

95. An expert was sent for one month in August 1967 to discuss the potential use of isotope techniques in the study of the principal hydrological problems, and to advise on the initial programme of work and on the equipment to be provided by the Iranian authorities.

96. The Agency also offered the authorities the possibility of training their staff prior to the arrival of the equipment and the visit of further experts. One scientist was trained at Heidelberg (Federal Republic of Germany) and on completion of his training returned to Teheran, together with the expert, for three months to initiate the first phase of the installation and commission part of the equipment. The same expert returned to Teheran in 1970 for a further period of three and a half months. During these two periods the Iranian scientist returned to Heidelberg for further training in the use of carbon-14 techniques for water dating and to collaborate in the construction of some additional equipment provided by the Agency at an extra cost of \$4000. During the latter period the expert was able to install and commission the remainder of the equipment provided by the Agency, as well as that purchased by the Iranian Government.

97. The laboratory is now working on radiocarbon and tritium dating of ground-water samples from the Varamin and Karadj area, and in addition to these environmental isotope studies, tritium tracer experiments, which were started during the first visit of the expert, are being continued.

98. A collateral and very interesting activity, namely the radiocarbon dating of archaeological samples provided by the Archaeological Institute of Teheran University, was carried out; this can be done with the same equipment. The laboratory now has three professionals on its staff, and the Agency is to provide additional training for two of them.

99. This project has achieved its objectives, since Iran now has the necessary tools and trained local manpower for the study of its hydrological problems. Moreover, the laboratory contributes to archaeological research, which is of importance to the social development of the country. However, in order to implement a growing programme of applied isotope hydrology successfully in Iran, it is necessary that the laboratory administrators and professionals contact, and collaborate with, Iranian hydrogeologists and hydrologists and also seek expert advice from outside when appropriate.

## 6. Uranium prospection in Peru

100. A programme of uranium prospection had been started in the 1950s, partly with bilateral assistance, and continued by the Atomic Energy Control Board since then on a limited scale. Interesting areas had already been found, but it was not possible to develop a more comprehensive national prospection programme which would demonstrate the potential contribution of uranium ore to the country's economy.

101. The Agency has approved a technical assistance project under its 1969 regular programme, and appointed an expert for six months to help organize aerial prospection, interpret the results, advise on equipment and train Peruvian staff. A special camera was also provided for aerial surveys.

102. Although the field-work was disrupted by the great earthquake of 1970 (all aircraft were requisitioned for a certain period), the project has produced results that have demonstrated the need for further steps to be taken in order to intensify the overall programme. To compensate for the delays due to the earthquake, and in accordance with special requests from the United Nations to take this into consideration in assistance programmes for Peru, the assignment of the expert was extended for a month. Despite the considerable difficulties encountered (work is being carried out in a region of very high mountains), nearly 4000 square kilometers have been surveyed, together with normal prospection of 1800 square kilometers in the Cuzco area alone.

103. The interest of the preliminary findings is such that the Peruvian Government has decided to extend and intensify the programme, for which increased funds will be allocated. Assistance has been requested under the 1971 regular programme and approval of the request has been recommended by the technical officers in the Secretariat. It is considered that there are good prospects that this project might result in the identification of significant reserves of uranium, which could be of great economic value for Peru.

## 7. Radiation and Isotope Centre, Khartoum General Hospital, Sudan

104. Following the visit of a consultant from WHO in 1959, the Ministry of Health decided to establish a Radiation and Isotope Centre in Khartoum. The detailed plan was drawn up by a joint mission, representing WHO and the Agency, in 1962 and further visits were made by an Agency regional adviser in the Middle East in 1963 and 1964 in connection with the subjects relating to hospital physics.

105. The Centre is designed primarily for the diagnosis of cancer and its treatment by radiotherapy, both of which had previously to be carried out outside Sudan, and facilities have also been provided for functional tests with radioisotopes in other branches of medicine.

106. Since the success of technical assistance projects is essentially dependent on continuity of work, the acquisition of the relevant skills by local personnel is a crucial factor in ensuring that work initiated by foreign experts can be continued and progressively extended. Hence the logical starting point of the project was the training of five Sudanese in hospital physics and in the clinical uses of radioisotope techniques. The building to house the radiotherapy unit was completed in 1965-66 and the Centre was equipped under bilateral arrangements with the Netherlands Government. After these preliminary efforts, the stage was reached where the Centre was ready to start operations. Under the regular programme the Agency, in order to give the Centre initial impetus, provided the services of a hospital physicist who took up duty in October 1966. His work involved in-service training of staff, securing adequate facilities for radium work, and repair and maintenance of equipment, and in carrying it out he had the close co-operation of a WHO radiotherapist and Sudanese counterparts. In connection with the expert's work, radiation measuring equipment valued at over \$7000 was provided by the United States Government in 1966.

107. The expert found that the radiation protection services were quite inadequate and his first task, therefore, was to establish an adequate radiation protection service for personnel in the Centre. Later, the service was extended to include X-ray diagnostic units in three Government hospitals in the Khartoum Omdurman area. The expert conducted a series of lectures on radiation protection for new students, with emphasis on radiation safety. About 20 X-ray diagnosis students attended the lectures and acquired skills of use in performing their X-ray duties. The expert further undertook a thorough survey of the radiation protection arrangements at the X-ray diagnostic units in Government hospitals and established that the work in at least some of those units, was in need of drastic overhaul.

108. The Centre now possesses good facilities for treatment by means of external radiation beams and for diagnostic tests involving the use of unsealed radioisotopes. During the expert's assignment from October 1966 to August 1969, the Centre handled 5133 patients, representing an average of approximately 147 per month. Of these, 1033 were new cases attending for radiotherapy, and over 3000 attended for diagnostic tests involving the use of radioisotopes. These figures are low in relation to the population of Sudan and are bound to increase with time, especially when the work of the Centre becomes widely known to, and accepted by, the population, techniques improve and more facilities become available. The greatest expansion is expected in diagnostic work as physicians and surgeons become more aware of the Centre's potential capabilities. In summary, the Centre is now operational and in the care of qualified Sudanese personnel who have been trained as part of the project and who are now in turn training other Sudanese in the same techniques.

#### 8. Development of a nuclear engineering training programme in Thailand

109. The Government of Thailand is embarking on a nuclear power programme. This programme forms part of the country's overall plans to develop generating capacity to meet the expanding power demand during the next ten years. The results of a feasibility study conducted in 1968 indicate that a 500-MW(e) nuclear generating unit would be feasible and economically more advantageous than alternative conventional steam generating stations. It is now considered that such a nuclear unit should be in service in 1979, when the power demand is expected to rise to 2500 MW.

110. A primary requirement of this programme is the development of competent manpower who will have major responsibility for the planning, construction, operation and maintenance of the proposed nuclear power plant. For a developing country like Thailand, where there is a shortage of highly-specialized skills, this requirement was considered not only to be essential but also to be one which required urgent and careful planning. As early as 1967, therefore, following the visit of an Agency mission, plans were made for the establishment of a nuclear engineering course at the Faculty of Engineering of Chulalongkorn University, with the co-operation of the Electricity Generating Authority of Thailand (EGAT) and the Office of Atomic Energy for Peace (OAEP). As planned, the University and the OAEP are to use their combined resources in staff and facilities, including the 1-MW swimming-pool research reactor at the Banghen Centre, in providing training to graduate engineers and scientists of EGAT. Some preliminary courses in reactor engineering, nuclear electronics and computer techniques have been started under this arrangement.

111. Assistance is being provided to this training project under the Agency's regular programme for 1970, consisting of the services of an expert, for six months, who will help develop the nuclear engineering course and advise on the detailed curricula, and an equipment grant of \$12 000 for an analogue computer suitable for operation as a reactor simulator. In addition, an extension of the services of the expert provided under the 1971 regular programme for a period of six months is proposed. In addition to this assistance, Agency fellowships have also been made available for staff of the University and OAEP who will be directly associated with the reactor school.

112. The Agency has also provided guidance in the establishment of this project. It is envisaged that the training programme being set up locally will meet urgent needs for trained staff, which is essential for the success of the country's nuclear power programme. This will not preclude the necessity of sending qualified engineers and scientists overseas for advanced training and higher education, but the need to do so will be minimized to a large extent when good training facilities have become available locally. This project, needless to say, is also expected to raise the level of technical education in the country. This, and the nuclear power programme itself, may well have a significant impact on the country's efforts to promote industrialization and economic development.



### Part III. CONCLUSIONS

113. Since inception of its technical assistance programme the Agency has provided assistance valued at \$28.6 million. This sum financed the assignments of 920 experts and visiting professors in 74 countries, 4503 fellowship awards for individual study, and the provision of equipment and supplies valued at \$5.9 million. In addition, 1679 persons participated in the 112 regional and interregional projects organized by the Agency. The year 1970 marked a stage of development of national atomic energy plans at which the initial impetus given by research reactors was resulting in the execution of scientific and technical projects, which were designed to introduce nuclear power into several developing countries, and technological advances, involving the use of nuclear techniques, were introduced into various industrial and technical processes.

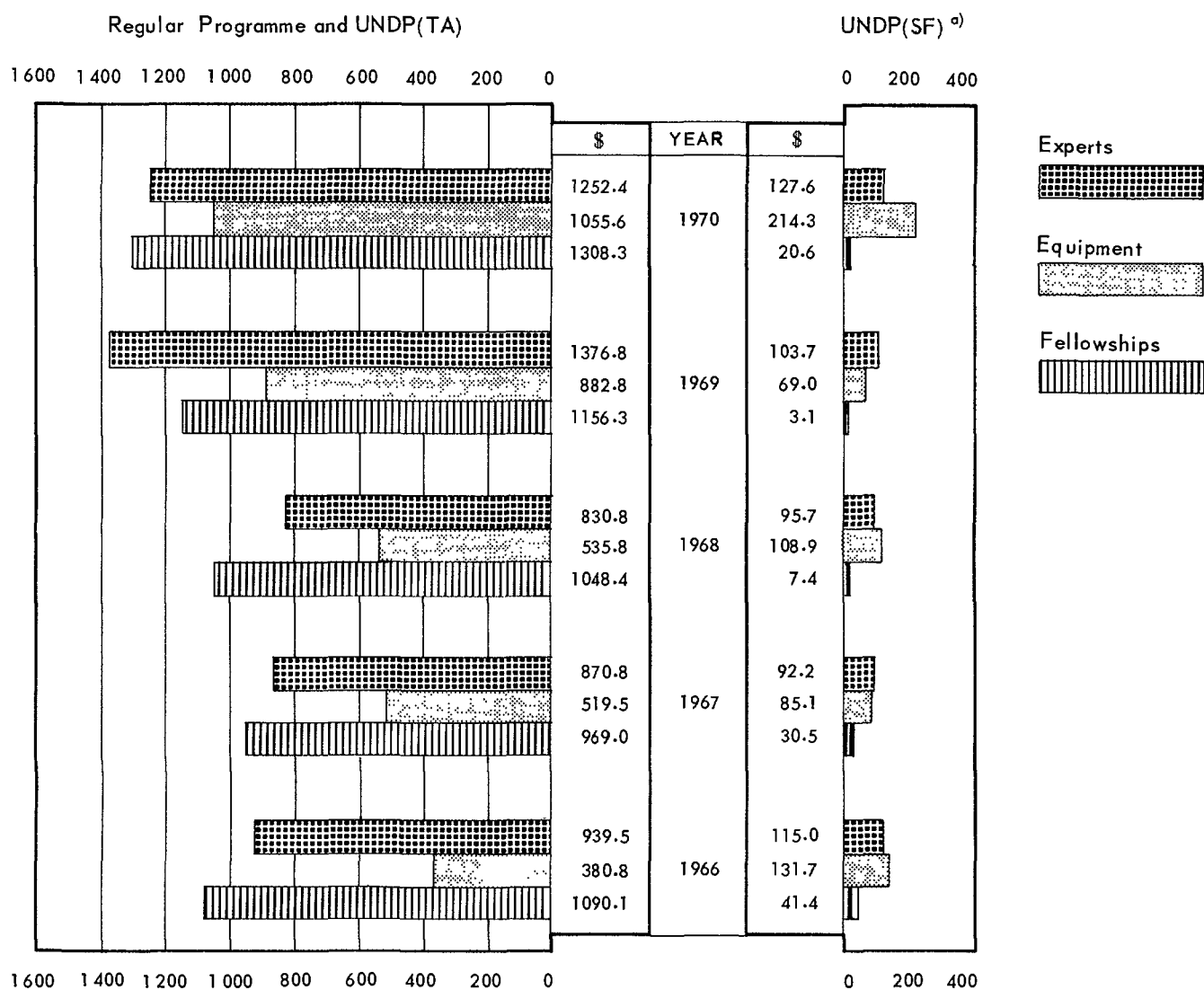
114. The programme is now being expanded to cover larger scale technological projects and is being widely utilized for research programmes and the development of a scientific infrastructure. This has been facilitated by the improved financial position under the regular programme resulting from the increase to \$2.5 million in the target for voluntary contributions to the General Fund for 1971 and an increase in gifts in kind. Expenditures, together with outstanding obligations at the end of 1970, should ensure that assistance valued at between \$4 and \$5 million will be provided in 1971, and, taking into account large-scale projects under UNDP, this figure will increase in the years to come.

115. The increase in the amount of assistance provided by the Agency is largely due to the use of regular programme resources as "seed money" for larger scale projects financed under UNDP. The latter programme continues to be used for longer term projects; this factor, combined with the necessity to meet the needs of new Member States joining the Agency and embarking for the first time on a programme involving the practical applications of atomic energy, renders it essential to have available a source of assistance separate from UNDP. However, the financial resources of the regular programme are such that the modest increase in the target for voluntary contributions is being more than offset by inflation and the financial resources available to the Agency from this source are therefore diminishing. Hence a further increase in the target would be justified.

116. The year 1972 will be the first one in which the new UNDP programming procedures will be applied in full. Small agencies participating in this programme will need the strong and continuing support of, for example, the atomic energy commissions and technical ministries in Member States requesting assistance to ensure that such States receive aid for their atomic energy activities. At the same time it has been recognized in UNDP and other United Nations bodies - not only in respect of nuclear energy programmes - that many Member States lack the administrative infrastructure which enables a Government to formulate and submit appropriate development projects with a view to obtaining multilateral assistance. Bearing in mind the fact that atomic energy programmes are integrated with scientific and technical development, increasing emphasis will have to be placed by the Agency, in close co-operation with Member States, on follow-up missions, advisory services and pre-project activities. This is particularly the case in countries embarking on atomic energy programmes for the first time and in situations where the benefits of nuclear energy can be expected to make an impact on economic and social development.

**FIGURE 7**

**TRENDS IN THE TECHNICAL CO-OPERATION ACTIVITIES OF THE AGENCY**  
(in thousands of dollars)



<sup>a)</sup> The UNDP(SF) figures given here do not reflect expenditures on sub-contracts and miscellaneous project costs, which include "experts" and "equipment"; these amounted to an additional \$409 800 in 1966-67, \$164 200 in 1968-69 and \$24 500 in 1970.

# A N N E X I

## STATISTICAL TABLES

### Introductory Notes

#### Resources

1. Fig. 1 and Table 1 show only the resources made available for approved field programmes of technical assistance and do not include EPTA or UNDP(TA) overhead cost allocations. In addition, data in respect of offers of assistance in kind have been up-dated to 31 December 1970; for example, the value of Type II fellowship offers has been adjusted, where necessary, to reflect the resources that were actually available when fellows took up their studies under Type II arrangements. The estimated value of all offers of assistance in kind in support of a given year's technical assistance programme is shown in columns (1b) and (2b) of Table 1.

2. All monetary values appearing under the headings "in kind", or "free experts" or "Type II fellowships" are estimated in accordance with the following rules:

- (a) Experts. The value of the services of each cost-free expert is estimated on the basis of the average salary of an equivalent expert engaged by the Agency and the applicable daily subsistence allowance as established by UNDP, plus the cost of a round-trip air ticket;
- (b) Equipment. The value of equipment is estimated according to the offer made by the donor Government (at the later, "assistance provided" stage, however, the value to the relevant project is based on the costs incurred); and
- (c) Fellowships. The value of Type II fellowships is estimated on the basis of the monthly stipend rate either as proposed by the host country or as established currently by UNDP, multiplied by the duration of the award in months. The estimated travel costs have been added if they were paid by the host country. (Training course stipends paid under this heading, however, are based on actual payments.)

These values and the totals in which they are included must therefore be considered as approximations.

#### Assistance provided

3. In Tables 4, 5, 7 and 8, the assistance provided by the Agency (experts, equipment and fellowships) includes actual cash payments against 1970 and prior years' obligations, regardless of the time when funds were made available or obligated, plus the total value of assistance in kind, shown according to the year in which it was provided. Thus, the unpaid balance of funds obligated in 1970 is not included in the financial data relating to assistance provided, but is shown separately in column 9 of Table 4; the total cumulative unpaid balance of funds obligated in 1970 and prior years is given at the bottom of this column in Tables 4, 7 and 8.

4. Assistance in kind has been separated into two parts. The first part consists of assistance which has been provided, for example, fellowship training already provided, expressed in terms of estimated cash expenditures. The second part is made up of assistance which is in the process of being provided - for example, fellowship training not yet completed - which is equivalent to unliquidated obligations (see column (10) in Tables 4, 7 and 8). The provision of expert services and equipment in kind has been shown in the same way.

5. Some minor corrections have also been made in the financial statistics relating to assistance provided in kind during prior years which take into account, inter alia, candidates who were withdrawn subsequent to the award of Type II fellowships, that is, after 31 December of a given year. Further, as the Agency exercises no financial control over assistance provided in kind, delay is occasionally experienced in receiving information on equipment deliveries, interruption in fellowship training, etc.

#### Types of assistance

6. (a) Experts. When not shown separately, the assignments of lecturers and visiting professors are included under the heading "Experts". With regard to Table 6, it should be noted that under "international projects" the assignments of a number of experts are not sub-divided by region but included, with associated training awards, under the heading "Short-term training projects";
- (b) Equipment. As can best be seen in Table 7, the total assistance provided under this heading is the sum of the amounts disbursed for equipment and supplies in respect of country programmes and international projects; and
- (c) Fellowships. In Table 3, where awards are classified by place of study, columns relating to short-term regional training projects and scientific visits have been introduced in order to reflect more accurately the valuable contribution made by host countries. The UNDP(TA) country, Agency Type I and Type II awards shown in Tables 3 and 6 constitute the total effective awards as of 31 December 1970 (all notifications of non-acceptances by the proposed host countries and of withdrawals by the nominating countries communicated to the Agency by the close of the year have been taken into account). In Table 6 the number of fellowships classified by nationality does not include awards for short-term training projects and scientific visits, since their inclusion would significantly distort the statistics relating primarily to holders of one-year fellowships. Although awards for short-term training projects and scientific visits are included in Table 6 under "UNDP(TA)" and "Agency Type I" (in Table 5 under "Number of fellowships") and are financed under "in kind" arrangements, the regular programme or UNDP(TA), they are not in the same category as Type I, Type II or the UNDP(TA) country awards. On the other hand, in the financial summaries (Tables 7 and 8) the expenditure on, for example, short-term training projects is not shown as assistance to individual countries but to "international projects". It will be noted that the total assistance provided in respect of "International projects" in Tables 7 and 8 corresponds to the relevant totals under "Short-term training projects" in Table 4. None of the tables includes any reference to local participants in short-term training projects.

#### International projects

7. In the broadest sense, this heading covers regional projects for which experts' services only were provided (for example, by regional advisers), regional and inter-regional projects for which experts, equipment and fellowships were provided (short-term training projects) and regional and inter-regional projects for which fellowships only were provided (for example, at the Trieste Centre). In the financial summaries only the expenditure on regional advisers, training at the Trieste Centre (Table 8 only) and short-term training projects is given under "International projects".

### UNDP(SF) activities and funds-in-trust arrangements

8. Although these are mentioned in the report as part of the Agency's technical co-operation activities, none of the statistical tables includes data relating to UNDP(SF) activities, or projects carried out under funds-in-trust arrangements.

### Figures and percentages

9. Due to the rounding-off of monetary amounts to the nearest hundred or thousand dollars, the totals indicated in various places may differ slightly. In preparing figures and tables, percentages have also been rounded off.

A. TECHNICAL ASSISTANCE RESOURCES

Table 1

Available resources: 1961 - 1970

(in thousands of dollars)

Year	UNDP(TA)		Agency		Sub-totals		TOTAL (3) + (4) (5)
	Monetary (1a)	In kind <sup>a/</sup> (1b)	Monetary (2a)	In kind <sup>a/</sup> (2b)	UNDP(TA) (3)	Agency (4)	
1961	786	1	981	518	787	1499	2286
1962	828	-	1146	588	828	1734	2562
1963	954	-	1230	480	954	1710	2664
1964	946	5	1115	613	951	1728	2679
1965	901	8	1200	502	909	1702	2611
1966	893	-	1263	518	893	1781	2674
1967	1076	3	1380	564	1079	1944	3023
1968	1134	5	1348	569	1139	1917	3056
1969	748	4	1586	620	752	2206	2958
1970	1134	11	1749	1031	1145	2780	3925
1961- 1970	9400	37	12998	6003	9437	19001	28438

<sup>a/</sup> Estimated; see Introductory Notes, paras 1 and 2, to this Annex.

Table 2

Funds for the Agency's regular programme of technical assistance: 1961 - 1970

(in thousands of dollars)

Item	1961-1966	1967	1968	1969	1970	1961-1970
Target for voluntary contributions to the General Fund <sup>a/</sup>	11 800	2 000	2 000	2 000	2 000	19 800
Budgeted for technical assistance	9 963	1 876	1 878	1 874	1 937	17 528
Amount pledged	8 061	1 432	1 424	1 487	1 672	14 076
Actually made available for technical assistance <sup>b/</sup>	6 935	1 380	1 348	1 586	1 749	12 998

<sup>a/</sup> A share of the funds from voluntary contributions is used to support other operational programme activities of the Agency; up to 1967 most of this share was used for research contracts, and over the period 1964 - 1969 \$210 000 was used for fellowships at the Trieste Centre.

<sup>b/</sup> The funds from voluntary contributions are supplemented by miscellaneous income accruing to the General Fund and to Operating Fund II; the additional income to Operating Fund II amounted to \$217 900 in 1969 and \$213 600 in 1970, which explains why the amount actually made available for technical assistance in those years exceeds the amount pledged.

Table 3

Experts in the field, classified by nationality, and fellowship awards, classified by place of study: 1970

Country of origin of experts or place of study for holders of fellowship awards	Experts					Fellowship awards						
	UNDP(TA)		Agency		TOTAL	UNDP(TA)		Agency			TOTAL	
	Paid	Free	Paid	Free		Country	Regional	Type I	Type II	Regional		Scientific visits
Argentina	1	-	2	-	3	-	12	1	4	-	-	17
Australia	1	-	1	-	2	1	2	4	-	-	1	8
Austria	4	-	-	-	4	-	-	1	2	-	-	3
Belgium	1	-	2	2	5	-	-	3	6a/	-	-	9
Brazil	-	-	-	-	-	-	-	-	2	-	-	2
Canada	3	-	5	-	8	3	-	5	-	18	2	28
Ceylon	-	-	-	-	-	-	1	-	-	-	-	1
Chile	-	-	1	-	1	-	-	-	-	-	-	-
China	1	-	2	-	3	-	3	-	-	-	-	3
CSSR	6	-	7	1	14	-	22	-	2	-	-	24
Denmark	2	-	1	-	3	1	15	2	6	-	2	26
Finland	1	-	-	-	1	-	-	-	-	-	-	-
France	8	-	6	3	17	6	-	30	11a/	-	7	54
Germany, F. R.	6	-	5	2	13	7	3	5	24a/	-	5	44
Greece	-	-	-	-	-	-	3	-	-	10	-	13
Hungary	3	-	5	1	9	-	1	-	-	-	-	1
Iceland	1	-	1	-	2	-	-	-	-	-	-	-
India	1	-	9	-	10	-	9	1	5	-	-	15
Indonesia	-	-	-	-	-	-	3	-	-	-	1	4
Iran	1	-	1	-	2	-	-	-	-	-	-	-
Israel	1	-	-	-	1	-	4	-	-	-	-	4
Italy	6	-	2	-	8	1	12	2	12	12	3	42
Japan	-	-	1	-	1	1	22	2	10a/	-	-	35
Kenya	-	-	-	-	-	-	4	-	-	-	-	4
Korea, R.	-	-	-	-	-	-	4	-	-	-	-	4
Mexico	1	-	-	-	1	-	-	-	-	-	-	-
Netherlands	1	-	3	1	5	3	-	3	6	19	3	34
New Zealand	1	-	-	-	1	-	-	-	-	-	-	-
Nigeria	1	-	-	-	1	-	-	-	-	-	-	-
Norway	2	-	3	-	5	-	-	-	-	-	-	-
Pakistan	1	-	-	-	1	-	1	-	-	-	-	1
Philippines	1	-	1	-	2	-	7	-	-	-	1	8
Poland	1	-	1	-	2	-	19	-	4b/	-	-	23
Puerto Rico	-	-	-	-	-	-	9	-	-	-	-	9
Romania	-	-	-	1	1	-	5	-	1	-	-	6
Spain	3	-	1	1	5	-	16	2	6	-	-	24
Sudan	-	-	-	-	-	-	10	-	-	-	-	10
Sweden	3	-	2	2	7	3	15	7	2	-	3	30
Switzerland	-	-	-	-	-	-	-	1	-	-	-	1
Thailand	1	-	-	-	1	-	7	-	-	-	-	7
UAR	2	-	3	-	5	-	-	-	-	-	-	-
UK	20	1	19	3	43	14	-	63	4a/	-	8	89
USA	15	-	23	5	43	11	-	21	49	36	3	120
USSR	4	-	3	-	7	-	15	-	5	-	1	21
Uruguay	-	-	1	-	1	-	-	2	-	-	-	2
Venezuela	1	-	-	-	1	-	-	-	-	-	-	-
Viet-Nam	-	-	1	-	1	-	-	-	-	-	-	-
Yugoslavia	-	-	3	-	3	-	30	-	2b/	14	-	46
Sub-total	105	1	115	22	243	51	254	155	163	109	40	772
CERN, Geneva	-	-	-	-	-	-	-	2	-	-	-	2
IAEA, Austria	-	-	-	-	-	1	2	10	1a/	-	2	16
Joint Institute for Nuclear Research, Dubna, USSR	-	-	-	-	-	-	-	-	3	-	-	3
NPY Reactor Physics Project	-	-	-	-	-	-	-	1	-	-	-	1
Pan-American Training Course on Metallurgy, Buenos Aires	-	-	-	-	-	-	-	2	-	-	-	2
Sub-total	-	-	-	-	-	1	2	15	4	-	2	24
GRAND TOTAL	105	1	115	22	243	52	256	170	167	109	42	796c/

a/ Includes one SIDA-financed award (in France three, in the United Kingdom four such awards).

b/ Includes one NPY project award (in Poland two such awards).

c/ The difference between the number of awards (634) and the number of places of study (796) is due to the fact that 11 fellows studied in two, five in three, one in four, one in five and one in six different countries; 18 participants in one study tour and 15 in another went to two and four countries respectively, whereas one, 18 and 25 participants in the demonstration projects in the regions of Africa, Asia and the Far East, and Europe and the Middle East respectively, and the 15 participants in the scientific visit programme, went to two, 46, 35 and 42 places of study respectively.

## B. DISTRIBUTION OF TECHNICAL ASSISTANCE

### Table 4

Types of technical assistance: 1961-1970 a/  
(in thousands of dollars)

TYPE	Experts		Visiting professors		Equipment		Fellowships		Research fellowships		Short-term training projects		Mobile radioisotope laboratory		TOTAL		Assistance outstanding		TOTAL (8)+(9) +(10) +(11)
															Unliquidated obligations	In kind balance <sup>b/</sup>			
															at 31 December 1970				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	
	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	%	\$	\$	\$
<b>1961-1966</b>																			
EPTA-UNDP(TA)	1881.1	41.3	-	-	930.6	20.4	886.7	19.5	-	-	852.7	18.7	2.2	0.1	4553.3	100.0	-	-	4553.3
Agency monetary	1982.8	30.6	608.4	9.4	1011.8	15.6	2203.2	34.0	131.2	2.0	460.1	7.1	83.4	1.3	6480.9	100.0	-	-	6480.9
Assistance in kind <sup>b/</sup>	117.8	3.3	-	-	459.5	13.0	2952.5	83.2	-	-	11.6	0.3	8.4	0.2	3549.8	100.0	-	4.1	3553.9
TOTAL	3981.7	27.3	608.4	4.2	2401.9	16.5	6042.4	41.4	131.2	0.9	1324.4	9.1	94.0	0.6	14584.0	100.0	-	4.1	14588.1
<b>1967</b>																			
UNDP(TA)	337.0	42.0	-	-	174.5	21.8	123.2	15.4	-	-	166.8	20.8	-	-	801.5	100.0	-	-	801.5
Agency monetary	345.4	34.7	90.4	9.1	220.4	22.2	232.5	23.4	19.3	1.9	86.6	8.7	-	-	994.6	100.0	-	-	994.6
Assistance in kind <sup>b/</sup>	1.6	0.3	-	-	75.1	13.3	483.2	85.8	-	-	3.3	0.6	-	-	563.2	100.0	-	0.7	563.9
TOTAL	684.0	29.0	90.4	3.8	470.0	19.9	838.9	35.6	19.3	0.8	256.7	10.9	-	-	2359.3	100.0	-	0.7	2360.0
<b>1968</b>																			
UNDP(TA)	378.9	42.8	-	-	224.2	25.3	96.8	11.0	-	-	184.9	20.9	-	-	884.8	100.0	-	-	884.8
Agency monetary	304.4	31.9	34.0	3.6	209.6	22.9	308.8	32.4	14.1	1.5	82.1	8.6	-	-	953.0	100.0	142.0	-	1095.0
Assistance in kind <sup>b/</sup>	0.6	0.1	-	-	80.4	13.9	485.4	84.1	-	-	10.8	1.9	-	-	577.2	100.0	-	18.0	595.2
TOTAL	683.9	28.3	34.0	1.4	514.2	21.3	891.0	36.9	14.1	0.6	277.8	11.5	-	-	2415.0	100.0	142.0	18.0	2575.0
<b>1969</b>																			
UNDP(TA)	579.2	46.8	-	-	296.7	24.0	132.0	10.6	-	-	230.0	18.6	-	-	1237.9	100.0	34.3	-	1272.2
Agency monetary	578.9	36.7	121.9	7.7	452.8	28.7	336.9	21.3	19.9	1.3	67.3	4.3	-	-	1577.7	100.0	245.7	-	1823.4
Assistance in kind <sup>b/</sup>	4.3	0.7	-	-	82.0	13.7	503.9	83.9	-	-	10.1	1.7	-	-	600.3	100.0	-	86.9	687.2
TOTAL	1162.4	34.0	121.9	3.6	831.5	24.3	972.8	28.5	19.9	0.6	307.4	9.0	-	-	3415.9	100.0	280.0	86.9	3782.8
<b>1970</b>																			
UNDP(TA)	465.0	42.1	-	-	305.9	27.7	108.8	9.8	-	-	225.9	20.4	-	-	1105.6	100.0	321.8	-	1427.4
Agency monetary	571.3 <sup>c/</sup>	35.3	75.9	4.7	409.8	25.3	401.6	24.8	18.9	1.2	141.8	8.7	-	-	1619.3	100.0	881.7	-	2501.0
Assistance in kind <sup>b/</sup>	20.8	2.3	-	-	300.8	33.8	512.9	57.5	-	-	56.9	6.4	-	-	891.4	100.0	-	514.7	1406.1
TOTAL	1057.1	29.2	75.9	2.1	1016.5	28.1	1023.3	28.3	18.9	0.5	424.6	11.8	-	-	3616.3	100.0	1203.5	514.7	5334.5
<b>1961-1970</b>																			
EPTA-UNDP(TA)	3641.2	42.4	-	-	1931.9	22.5	1347.5	15.7	-	-	1660.3	19.4	2.2	0.0	8583.1	100.0	356.1	-	8939.2
Agency monetary	3782.8	32.5	930.6	8.0	2304.4	19.8	3483.0	30.0	203.4	1.8	837.9	7.2	83.4	0.7	11625.5	100.0	1269.4	-	12894.9
Assistance in kind <sup>b/</sup>	145.1	2.4	-	-	997.8	16.1	4937.9	79.9	-	-	92.7	1.5	8.4	0.1	6181.9	100.0	-	624.4	6806.3
GRAND TOTAL	7569.1	28.7	930.6	3.5	5234.1	19.8	9768.4	37.0	203.4	0.8	2590.9	9.8	94.0	0.4	26390.5	100.0	1625.5	624.4	28640.4

<sup>a/</sup> Data as at 31 December 1970.

<sup>b/</sup> Estimated; see Introductory Notes, paras 4 and 5, to this Annex.

<sup>c/</sup> The 1970 figures for "Experts" include miscellaneous and bank charges amounting to \$8 000 under "Agency monetary".



Table 5

Fields of activity of technical assistance: 1970

Field	Number of expert assignments	Cost of equipment (in thousands of dollars)	Number of fellowship awards <sup>a/</sup>
General atomic energy development	18	25.1	64
Nuclear physics	28	93.2	102
Nuclear chemistry	18	130.2	29
Prospecting, mining and processing of nuclear materials	14	62.4	44
Nuclear engineering and technology	33	148.3	105
Application of isotopes and radiation in agriculture	63	272.2	114
Application of isotopes and radiation in medicine	23	105.4	67
Application of isotopes and radiation in biology	11	14.6	21
Other fields of application of isotopes and radiation	27	136.9	57
Safety in nuclear energy	17	67.3	31
TOTAL	252 <sup>b/</sup>	1055.6	634

<sup>a/</sup> These figures include 249 participants in 17 regional and inter-regional training projects and 15 holders of awards for scientific visits.

<sup>b/</sup> The difference between the number of assignments by field of activity (252) and by recipient country (251; see Fig. 2B) is due to the fact that one expert served in two different fields of activity in the same country.

Table 6

Recipients of expert services and fellowship awards: 1970

RECIPIENT	Number of expert assignments, classified by location of duty station										Number of fellowship awards, classified by nationality of recipient							
	UNDP(TA)				Agency				TOTAL		UNDP(TA)		Agency				TOTAL	
	Paid		Free		Paid		Free		(1)	(2)	(1)	(2)	Type I		Type II		(1)	(2)
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)					(1)	(2)	(1)	(2)		
<u>Country programmes:</u>																		
Algeria	-	-	-	-	-	-	-	-	-	-	-	-	4	45	-	-	4	45
Argentina	2	4	-	-	3	6	-	-	5	10	1	2	3	27	3	36	7	65
Austria	-	-	-	-	-	-	-	-	-	-	-	-	1	3	-	-	1	3
Bolivia	-	-	-	-	1	3	-	-	1	3	2	12	3	34	2	24	7	70
Brazil	3	15	-	-	3	4	-	-	6	19	-	-	6	55	9	85	15	140
Bulgaria	-	-	-	-	-	-	-	-	-	-	3	9	6	61	5	48	14	118
Burma	2	22	-	-	1	3	-	-	3	25	-	-	2	18	-	-	2	18
Cameroon	1	12	-	-	1	3	-	-	2	15	1	9	-	-	-	-	1	9
Ceylon	-	-	-	-	3	9	-	-	3	9	-	-	-	-	1	12	1	12
Chile	1	2	-	-	4	24	-	-	5	26	-	-	6	53 <sup>a/</sup>	5	46	11	99
China	-	-	-	-	1	6	-	-	1	6	2	11	6	61	5	57	13	129
Colombia	1	1	-	-	2	7	1	3	4	11	-	-	3	26	1	6 <sup>b/</sup>	4	32
Congo, D.R.	-	-	-	-	3	20	-	-	3	20	-	-	1	6	-	-	1	6
Cuba	-	-	-	-	-	-	-	-	-	-	-	-	3	30	1	12	4	42
Cyprus	1	6	-	-	-	-	-	-	1	6	-	-	2	14	-	-	2	14
CSSR	-	-	-	-	-	-	-	-	-	-	-	-	6	70	2	16	8	86
Ecuador	-	-	-	-	-	-	-	-	-	-	-	-	1	12	-	-	1	12
El Salvador	-	-	-	-	1	6	-	-	1	6	-	-	-	-	-	-	-	-
Ethiopia	-	-	-	-	1	2	-	-	1	2	-	-	1	10	1	6	2	16
Ghana	1	12	-	-	2	5	1	1	4	18	-	-	4	18	1	6	5	24
Greece	3	9	-	-	8	11	-	-	11	20	5	28	6	61	5	43	16	132
Guatemala	-	-	-	-	1	3	-	-	1	3	-	-	1	8 <sup>a/</sup>	1	12 <sup>b/</sup>	2	20
Hungary	-	-	-	-	3	4	-	-	3	4	1	1	6	59	4	44	11	104
Iceland	-	-	-	-	-	-	-	-	-	-	-	-	1	12	-	-	1	12
India	-	-	-	-	4	9	-	-	4	9	7	66	6	54	9	99	22	219
Indonesia	1	5	-	-	7	27	-	-	8	32	-	-	2	15	4	42	6	57
Iran	3	17	-	-	1	3	2	2	6	22	-	-	3	30	3	36	6	66
Iraq	2	15	-	-	2	8	-	-	4	23	1	12	4	46	9	108	14	166
Israel	-	-	-	-	1	2	-	-	1	2	-	-	2	15	1	12	3	27
Jordan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	12	1	12
Khmer Republic	1	7	-	-	-	-	-	-	1	7	-	-	-	-	-	-	-	-
Korea, R.	-	-	-	-	3	12	-	-	3	12	-	-	2	24	9	94	11	118
Kuwait	-	-	-	-	-	-	-	-	-	-	-	-	1	12	-	-	1	12
Lebanon	-	-	-	-	2	13	-	-	2	13	-	-	5	40	1	8	6	48
Libyan A. R.	-	-	-	-	1	1	-	-	1	1	-	-	-	-	-	-	-	-
Madagascar	-	-	-	-	1	3	-	-	1	3	-	-	-	-	-	-	-	-
Malaysia	-	-	-	-	-	-	-	-	-	-	-	1 <sup>b/</sup>	3	36	1	12	4	49
Mexico	5	11	-	-	-	-	-	-	5	11	-	-	1	12	4	39	5	51
Morocco	1	5	-	-	2	18	2	1	5	24	-	-	5	51	5	27	10	78
Nigeria	2	18	-	-	2	6	1	1	5	25	-	-	-	-	1	12	1	12
Pakistan	-	-	-	-	2	13	-	-	2	13	1	12	4	48 <sup>a/</sup>	9	94	14	154
Peru	2	6	-	-	3	20	-	-	5	26	-	-	-	-	1	6	1	6
Philippines	-	-	-	-	3	7	-	-	3	7	1	12	6	73 <sup>a/</sup>	5	52	12	137
Poland	1	1	-	-	1	1	-	-	2	2	1	3	5	60	7	82	13	145
Romania	-	-	-	-	1	2	-	-	1	2	1	3	6	56	8	78	15	137
Senegal	1	9	-	-	2	4	-	-	3	13	-	-	-	-	-	-	-	-
Sierra Leone	1	12	-	-	2	1	-	-	3	13	-	-	-	-	1	12	1	12
Singapore	-	-	-	-	1	8	-	-	1	8	-	-	1	6	-	-	1	6
Spain	-	-	-	-	-	-	-	-	-	-	-	-	1	10	-	-	1	10
Sudan	-	-	-	-	-	-	-	-	-	-	-	-	3	25	-	-	3	25
Syrian A. R.	-	-	-	-	-	-	-	-	-	-	-	-	1	10	-	-	1	10
Thailand	3	11	-	-	1	4	-	-	4	15	2	18	6	70	6	69	14	157
Tunisia	-	-	-	-	1	1	-	-	1	1	-	-	2	21	-	-	2	21
Turkey	3	20	-	-	6	16	-	-	9	36	3	36	3	36	7	81	13	153
Uganda	1	12	-	-	1	5	-	-	2	17	-	-	1	2	1	1	2	3

RECIPIENT	Number of expert assignments, classified by location of duty station										Number of fellowship awards, classified by nationality of recipient							
	UNDP(TA)				Agency				TOTAL		UNDP(TA)		Agency				TOTAL	
	Paid		Free		Paid		Free		(1)	(2)	(1)	(2)	Type I		Type II		(1)	(2)
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)					(1)	(2)	(1)	(2)		
UAR	-	-	-	-	3	12	-	-	3	12	6	-	6	48	10	114	16	162
Uruguay	1	7	-	-	-	-	-	-	1	7	-	-	2	17	2	15	4	32
Venezuela	1	6	-	-	1	6	-	-	2	12	-	-	1	12	3	36	4	48
Viet-Nam	-	-	-	-	1	3	-	-	1	3	-	-	2	12	3	26	5	38
Yugoslavia	4	4	-	-	5	6	-	-	9	10	2	10	3	30	6	61	11	101
Zambia	1	2	-	-	2	14	-	-	3	16	-	-	-	-	-	-	-	-
Sub-total	49	251	-	-	100	341	7	8	156	600	34	245	159	1554	163	1681	356	3480
<u>International projects</u>																		
Short-term training projects	59	41	1	1	20	15	15	4	95	61	172	225	77	121	14	19	263	365
Scientific visits	-	-	-	-	-	-	-	-	-	-	-	-	15	23	-	-	15	23
Sub-total	59	41	1	1	20	15	15	4	95	61	172	225	92	144	14	19	278	388
GRAND TOTAL	108	292	1	1	120	356	22	12	251 <sup>c/</sup>	661	206	470	251	1698	177	1700	634	3868

(1) Number.

(2) Number of man-months.

<sup>a/</sup> One award was financed from two sources; as the greater number of man-months was approved under Type II arrangements, the award is shown under "Type II".

<sup>b/</sup> One award was financed from two sources; as the greater number of man-months was financed under Type I arrangements, the award is shown under "Type I".

<sup>c/</sup> The difference between the number of assignments (251) and the actual number of experts (243) is due to the fact that each of eight experts served in two different countries.

Table 7

## Financial summary: 1970

(in thousands of dollars)

RECIPIENT	Assistance provided									Assistance outstanding		TOTAL (8)+(9) +(10)
	By type				By source					Unliquidated obligations at 31 December 1970	In kind balance <sup>a/</sup> December 1970	
	Experts	Equip- ment	Fellow- ships	TOTAL	UNDP(TA)		Agency		TOTAL			
					Monetary	In kind <sup>a/</sup>	Monetary	In kind <sup>a/</sup>				
(1)	(2)	(3)	(4)	(5a)	(5b)	(6)	(7)	(8)	(9)	(10)	(11)	
<u>Country programmes</u>												
Afghanistan	-	(0.1)	1.4	1.3	-	-	(0.1)	1.4	1.3	-	-	1.3
Albania	-	9.3	1.0	10.3	-	-	9.3	1.0	10.3	3.6	-	13.9
Algeria	-	-	10.1	10.1	-	-	10.1	-	10.1	4.9	-	15.0
Argentina	18.6	29.5	26.4	74.5	37.1	-	28.2	9.2	74.5	35.3	11.4	121.2
Austria	-	-	1.1	1.1	-	-	1.1	-	1.1	0.3	-	1.4
Bolivia	5.3	41.9	15.1	62.3	34.0	-	22.0	6.3	62.3	39.5	9.8	111.6
Brazil	43.4	29.3	62.0	134.7	51.9	-	49.7	33.1	134.7	61.6	29.3	225.6
Bulgaria	0.7	37.0	39.1	76.8	20.4	-	35.3	21.1	76.8	37.4	18.1	125.3
Burma	47.2	29.5	17.2	93.9	61.1	-	26.9	5.9	93.9	46.9	1.5	142.3
Cameroon	26.2	6.3	1.9	34.4	23.1	-	11.3	-	34.4	16.3	-	50.7
Ceylon	14.8	15.0	6.4	36.2	3.4	-	32.8	-	36.2	25.1	6.5	67.8
Chile	42.3	29.3	22.3	93.9	15.5	-	58.0	20.4	93.9	45.2	10.0	149.1
China	13.9	11.4	32.8	58.1	18.4	-	21.0	18.7	58.1	50.6	27.7	136.4
Colombia	21.9	31.9	14.6	68.4	2.4	-	19.4	46.6	68.4	6.0	27.0	101.4
Congo, D.R.	36.1	5.2	5.9	47.2	-	-	43.2	4.0	47.2	32.1	-	79.3
Cuba	-	8.5	0.8	9.3	-	-	9.3	-	9.3	46.1	6.1	61.5
Cyprus	10.1	4.1	4.7	18.9	10.7	-	8.2	-	18.9	20.1	-	39.0
CSSR	-	-	26.2	26.2	-	-	17.3	8.9	26.2	22.0	4.5	52.7
Ecuador	1.5	0.7	0.6	2.8	-	-	2.2	0.6	2.8	3.9	-	6.7
El Salvador	9.4	12.8	3.0	25.2	-	-	9.4	15.8	25.2	0.3	-	25.5
Ethiopia	4.8	6.4	7.2	18.4	-	-	12.0	6.4	18.4	2.7	2.8	23.9
Ghana	38.3	23.4	12.1	73.8	19.5	-	51.1	3.2	73.8	7.0	1.5	82.3
Greece	28.2	26.2	55.8	110.2	27.4	-	37.3	45.5	110.2	46.5	10.2	166.9
Guatemala	6.3	-	-	6.3	1.0	-	5.3	-	6.3	14.4	1.4	22.1
Hungary	6.6	34.1	38.9	79.6	20.9	-	42.3	16.4	79.6	39.4	10.5	129.5
Iceland	(0.3)	9.3	5.6	14.6	-	-	14.6	-	14.6	9.4	-	24.0
India	17.6	26.7	46.1	90.4	9.3	-	29.0	52.1	90.4	81.8	47.2	219.4
Indonesia	62.2	22.2	26.8	111.2	8.1	-	73.3	29.8	111.2	16.1	10.6	137.9
Iran	43.8	3.1	19.7	66.6	33.3	-	16.5	16.8	66.6	13.4	11.6	91.6
Iraq	40.3	4.9	53.6	98.8	26.4	-	40.4	32.0	98.8	21.2	32.5	152.5
Israel	3.2	26.9	5.1	35.2	-	-	19.6	15.6	35.2	16.4	4.7	56.3
Jamaica	-	12.2	4.6	16.8	-	-	4.6	12.2	16.8	3.3	-	20.1
Jordan	-	-	-	-	-	-	-	-	-	-	9.2	9.2
Kenya	-	20.5	-	20.5	(0.1)	-	-	20.6	20.5	-	-	20.5
Khmer Republic	15.6	-	-	15.6	14.6	-	1.0	-	15.6	-	-	15.6
Korea, R.	23.2	30.4	32.1	85.7	-	-	35.4	50.3	85.7	32.9	34.1	152.7
Kuwait	-	-	1.0	1.0	-	-	1.0	-	1.0	8.2	-	9.2
Lebanon	18.8	6.8	5.8	31.4	-	-	25.0	6.4	31.4	22.2	4.8	58.4
Libyan A.R.	0.2	-	-	0.2	-	-	0.2	-	0.2	0.3	-	0.5
Madagascar	6.2	14.6	-	20.8	-	-	20.8	-	20.8	11.5	-	32.3
Malaysia	-	-	4.3	4.3	1.4	-	2.9	-	4.3	13.7	3.6	21.6
Mexico	26.8	34.7	4.2	65.7	54.1	-	1.0	10.6	65.7	66.3	10.0	142.0
Morocco	42.0	19.2	6.0	67.2	7.1	-	57.4	2.7	67.2	29.1	7.4	103.7
Nicaragua	1.3	0.3	-	1.6	-	-	1.6	-	1.6	0.1	-	1.7
Nigeria	47.2	26.5	3.5	77.2	32.9	-	38.1	6.2	77.2	45.9	7.2	130.3
Pakistan	24.2	23.3	53.5	101.0	0.5	-	56.9	43.6	101.0	66.4	37.5	204.9
Peru	43.8	20.5	1.8	66.1	15.8	-	50.3	-	66.1	9.5	3.9	79.5
Philippines	14.1	52.2	55.8	122.1	12.3	-	46.2	63.6	122.1	55.3	34.4	211.8
Poland	3.8	30.2	34.5	68.5	16.9	-	34.5	17.1	68.5	22.1	21.9	112.5
Romania	3.5	5.6	37.4	46.5	15.9	-	19.7	10.9	46.5	37.1	25.7	109.3
Senegal	22.6	8.8	-	31.4	23.6	-	7.8	-	31.4	4.8	-	36.2
Sierra Leone	26.0	-	-	26.0	21.0	-	5.0	-	26.0	3.5	7.0	36.5
Singapore	20.3	9.6	1.5	31.4	-	-	31.4	-	31.4	14.8	-	46.2
Spain	-	-	-	-	-	-	-	-	-	3.6	-	3.6
Sudan	-	4.5	5.9	10.4	-	-	10.4	-	10.4	35.3	-	45.7

RECIPIENT	Assistance provided									Assistance outstanding		TOTAL (8) + (9) + (10)
	By type				By source					Unliquidated obligations at 31 December 1970	In kind balance <sup>a/</sup>	
	Experts	Equip- ment	Fellow- ships	TOTAL	UNDP (TA)		Agency		TOTAL			
					Monetary	In kind <sup>a/</sup>	Monetary	In kind <sup>a/</sup>				
(1)	(2)	(3)	(4)	(5a)	(5b)	(6)	(7)	(8)	(9)	(10)	(11)	
Syrian A.R.	-	0.8	0.3	1.1	1.1	-	-	-	1.1	20.8	7.7	29.6
Thailand	31.4	8.6	56.0	96.0	38.6	-	31.2	26.2	96.0	43.0	24.6	163.6
Tunisia	9.1	5.8	7.7	22.6	3.4	-	15.5	3.7	22.6	5.8	0.5	28.9
Turkey	64.1	16.6	39.9	120.6	47.4	-	37.4	35.8	120.6	32.2	16.6	169.4
Uganda	28.0	13.0	4.5	45.5	19.7	-	20.1	5.7	45.5	16.6	-	62.1
UAR	22.1	60.1	39.0	121.2	27.1	-	70.9	23.2	121.2	69.5	38.3	229.0
Uruguay	11.7	46.6	9.0	67.3	40.6	-	3.4	23.3	67.3	38.3	8.2	113.8
Venezuela	21.2	-	23.8	45.0	11.2	-	13.0	20.8	45.0	11.0	12.9	68.9
Viet-Nam	6.3	13.6	9.1	29.0	-	-	7.7	21.3	29.0	5.4	5.2	39.6
Yugoslavia	17.2	32.5	37.5	87.2	44.3	-	23.4	19.5	87.2	18.4	18.8	124.4
Zambia	31.9	14.2	-	46.1	6.4	-	39.7	-	46.1	10.9	-	57.0
Sub-total	1 125.0	1 016.5	1 042.2	3 183.7	879.7	-	1 469.5	834.5	3 183.7	1 516.3	624.4	5 324.4
<u>International projects</u>												
Africa	18.6	3.3	2.3	24.2	21.7	2.5	-	-	24.2	3.5	-	27.7
Americas	16.4	1.3	17.8	35.5	32.0	3.5	-	-	35.5	31.3	-	66.8
Asia and the Far East	10.5	1.5	26.5	38.5	36.2	2.3	-	-	38.5	26.5	-	65.0
Inter-regional projects	73.9	33.0	219.5	326.4	136.0	3.1	141.8	45.5	326.4	47.9	-	374.3
Sub-total	119.4	39.1	266.1	424.6	225.9	11.4	141.8	45.5	424.6	109.2	-	533.8
<u>Miscellaneous</u>												
Bank charges	8.0	-	-	8.0	-	-	8.0	-	8.0	-	-	8.0
GRAND TOTAL	1 252.4	1 055.6	1 308.3	3 616.3	1 105.6	11.4	1 619.3	880.0	3 616.3	1 625.5	624.4	5 866.2

<sup>a/</sup> Assistance in kind can only be estimated; see Introductory Notes, paras 4 and 5, to this Annex.

Table 8  
Financial summary: 1958 - 1970  
(in thousands of dollars)

RECIPIENT	Assistance provided									Assistance outstanding		TOTAL (8)+(9) +(10)
	By type				By source					Unliquidated obligations	In kind balance <sup>a/</sup>	
	Experts	Equip- ment	Fellow- ships	TOTAL	UNDP (TA)		Agency		TOTAL			
					Monetary (5a)	In kind <sup>a/</sup> (5b)	Monetary (6)	In kind <sup>a/</sup> (7)		TOTAL (8)	at 31 December 1970 (9)	
(1)	(2)	(3)	(4)	(5a)	(5b)	(6)	(7)	(8)	(9)	(10)	(11)	
<u>Country programmes</u>												
Afghanistan	74.9	78.5	56.2	209.6	70.1	-	86.4	53.1	209.6	-	-	209.6
Albania	-	9.3	13.3	22.6	-	-	9.3	13.3	22.6	3.6	-	26.2
Algeria	11.0	-	22.5	33.5	10.3	-	16.2	7.0	33.5	4.9	-	38.4
Argentina	463.9	327.0	443.5	1 234.4	458.0	0.6	487.7	288.1	1 234.4	35.3	11.4	1 281.1
Austria	62.0	13.8	110.8	186.6	-	-	127.1	59.5	186.6	0.3	-	186.9
Bolivia	85.6	107.8	59.2	252.6	80.8	-	141.1	30.7	252.6	39.5	9.8	301.9
Brazil	524.3	300.0	382.8	1 207.1	485.2	-	496.2	225.7	1 207.1	61.6	29.3	1 298.0
Bulgaria	4.9	63.1	245.2	313.2	26.4	-	198.9	87.9	313.2	30.4	18.1	361.7
Burma	310.4	168.4	103.5	582.3	408.8	-	113.3	60.2	582.3	46.9	1.5	630.7
Cameroon	45.1	7.9	1.9	54.9	43.6	-	11.3	-	54.9	16.3	-	71.2
Ceylon	188.5	96.1	35.3	319.9	103.1	-	179.9	36.9	319.9	25.1	6.5	351.5
Chile	219.2	148.7	150.9	518.8	160.1	-	244.8	113.9	518.8	45.2	10.0	574.0
China	219.8	104.5	465.7	790.0	237.8	-	231.8	320.4	790.0	50.6	27.7	868.3
Colombia	168.4	98.5	132.2	399.1	132.0	-	111.6	155.5	399.1	6.0	27.0	432.1
Congo, D.R.	77.6	44.9	25.2	147.7	9.6	-	113.3	24.8	147.7	32.1	-	179.8
Costa Rica	5.6	10.7	-	16.3	-	-	5.6	10.7	16.3	-	-	16.3
Cuba	27.9	15.3	8.8	52.0	-	-	49.1	2.9	52.0	46.1	6.1	104.2
Cyprus	12.5	20.1	8.5	41.1	21.4	-	18.6	1.1	41.1	20.1	-	61.2
CSSR	-	-	257.5	257.5	-	-	170.0	87.5	257.5	22.0	4.5	284.0
Denmark	12.9	-	31.3	44.2	-	-	31.2	13.0	44.2	-	-	44.2
Ecuador	46.3	33.0	62.8	142.1	35.5	-	67.1	39.5	142.1	3.9	-	146.0
El Salvador	41.1	18.8	9.5	69.4	14.1	-	30.1	25.2	69.4	0.3	-	69.7
Ethiopia	14.5	15.1	13.4	43.0	-	-	36.6	6.4	43.0	2.7	2.8	48.5
Finland	0.5	-	39.4	39.9	1.8	-	7.2	30.9	39.9	-	-	39.9
France	-	-	15.9	15.9	-	-	2.4	13.5	15.9	-	-	15.9
Germany, F.R.	-	1.6	1.4	3.0	-	-	3.0	-	3.0	-	-	3.0
Ghana	231.7	71.7	84.0	387.4	111.7	-	238.1	37.6	387.4	7.0	1.5	395.9
Greece	499.3	90.6	305.4	895.3	326.6	-	349.1	219.6	895.3	46.5	10.2	952.0
Guatemala	31.3	47.2	27.5	106.0	49.1	-	39.5	17.4	106.0	14.4	1.4	121.8
Hong Kong	20.0	20.6	-	40.6	-	-	40.6	-	40.6	-	-	40.6
Hungary	34.4	117.5	331.2	483.1	75.6	-	307.6	99.9	483.1	39.4	10.5	533.0
Iceland	25.4	72.1	21.4	118.9	-	-	66.5	52.4	118.9	9.4	-	128.3
India	55.0	127.7	621.7	804.4	183.1	-	217.2	404.1	804.4	81.8	47.2	933.4
Indonesia	324.4	124.9	545.0	994.3	214.4	-	372.2	407.7	994.3	16.1	10.6	1 021.0
Iran	446.8	40.9	329.1	816.8	345.1	0.5	273.3	197.9	816.8	13.4	11.6	841.8
Iraq	248.3	73.4	284.9	606.6	182.4	-	256.5	167.7	606.6	21.2	32.5	660.3
Israel	155.6	200.9	104.6	461.1	112.9	-	247.0	101.2	461.1	16.4	4.7	482.2
Italy	9.0	-	160.1	169.1	-	-	95.6	73.5	169.1	-	-	169.1
Ivory Coast	6.0	4.3	2.9	13.2	10.3	-	2.9	-	13.2	-	-	13.2
Jamaica	7.5	21.4	4.6	33.5	10.4	-	10.9	12.2	33.5	3.3	-	36.8
Japan	50.1	-	322.3	372.4	49.8	-	129.4	193.2	372.4	-	-	372.4
Jordan	28.1	-	12.4	40.5	39.6	-	0.9	-	40.5	-	9.2	49.7
Kenya	26.4	73.5	7.9	107.8	27.4	-	58.8	21.6	107.8	-	-	107.8
Khmer Republic	85.0	29.3	1.7	116.0	39.1	-	69.6	7.3	116.0	-	-	116.0
Korea, R.	227.0	104.5	581.7	913.2	115.0	-	399.1	399.1	913.2	32.9	34.1	980.2
Kuwait	-	-	1.0	1.0	-	-	1.0	-	1.0	8.2	-	9.2
Lebanon	69.2	33.2	28.6	131.0	-	-	117.6	13.4	131.0	22.2	4.8	158.0
Libyan A.R.	0.2	-	-	0.2	-	-	0.2	-	0.2	0.3	-	0.5
Madagascar	6.2	22.3	1.9	30.4	-	-	30.4	-	30.4	11.5	-	41.9
Malaysia	-	-	4.3	4.3	1.4	-	2.9	-	4.3	13.7	3.6	21.6
Mali	2.1	-	-	2.1	2.1	-	-	-	2.1	-	-	2.1
Mexico	344.8	182.8	179.0	706.6	288.2	-	284.5	133.9	706.6	66.3	10.0	782.9
Monaco	-	-	4.2	4.2	-	-	4.2	-	4.2	-	-	4.2
Morocco	120.7	76.6	49.6	246.9	50.8	-	169.7	26.4	246.9	29.1	7.4	283.4
Netherlands	-	-	17.8	17.8	-	-	10.8	7.0	17.8	-	-	17.8

RECIPIENT	Assistance provided									Assistance outstanding		TOTAL (8)+(9) +(10)
	By type				By source					Unliquidated obligations at 31 December 1970	In kind balance <sup>a/</sup> 1970	
	Experts	Equip- ment	Fellow- ships	TOTAL	UNDP (TA)		Agency		TOTAL			
					Monetary (5a)	In kind <sup>a/</sup> (5b)	Monetary (6)	In kind <sup>a/</sup> (7)				
(1)	(2)	(3)	(4)	(5a)	(5b)	(6)	(7)	(8)	(9)	(10)	(11)	
New Zealand	-	-	37.2	37.2	-	-	26.2	11.0	37.2	-	-	37.2
Nicaragua	13.9	7.4	20.1	41.4	-	-	41.4	-	41.4	0.1	-	41.5
Nigeria	82.5	59.2	32.6	174.3	57.0	-	74.5	42.8	174.3	45.9	7.2	227.4
Norway	-	-	9.6	9.6	-	-	5.3	4.3	9.6	-	-	9.6
Pakistan	360.7	224.0	412.7	997.4	263.9	-	460.4	273.1	997.4	66.4	37.5	1 101.3
Panama	4.1	-	-	4.1	4.1	-	-	-	4.1	-	-	4.1
Paraguay	10.3	4.6	32.1	47.0	-	-	31.3	15.7	47.0	-	-	47.0
Peru	138.2	65.8	39.2	243.2	90.9	-	130.1	22.2	243.2	9.5	3.9	256.6
Philippines	278.8	299.8	582.0	1 160.6	372.7	8.9	381.9	397.1	1 160.6	55.3	34.4	1 250.3
Poland	7.3	156.0	513.7	677.0	159.8	-	359.4	157.8	677.0	22.1	21.9	721.0
Portugal	57.5	45.9	37.7	141.1	-	-	88.9	52.2	141.1	-	-	141.1
Rhodesia	2.2	17.8	7.6	27.6	25.4	-	2.2	-	27.6	-	-	27.6
Romania	25.8	64.9	227.3	318.0	45.0	-	190.8	82.2	318.0	37.1	25.7	380.8
Saudi Arabia	18.8	2.9	10.5	32.2	-	-	25.2	7.0	32.2	-	-	32.2
Senegal	100.2	72.2	10.6	183.0	76.8	0.8	105.4	-	183.0	4.8	-	187.8
Sierra Leone	49.3	-	-	49.3	25.5	-	23.8	-	49.3	3.5	7.0	59.8
Singapore	40.6	28.9	2.9	72.4	-	-	68.7	3.7	72.4	14.8	-	87.2
South Africa	-	-	107.8	107.8	-	-	42.1	65.7	107.8	-	-	107.8
Spain	-	-	54.1	54.1	-	-	31.0	23.1	54.1	3.6	-	57.7
Sudan	90.7	46.0	41.1	177.8	27.7	-	142.0	8.1	177.8	35.3	-	213.1
Sweden	-	-	8.8	8.8	-	-	8.8	-	8.8	-	-	8.8
Switzerland	-	-	12.6	12.6	-	-	5.6	7.0	12.6	-	-	12.6
Syrian A.R.	3.8	5.6	4.5	13.9	13.9	-	-	-	13.9	20.8	7.7	42.4
Thailand	515.7	151.6	611.3	1 278.6	425.8	-	514.7	338.1	1 278.6	43.0	24.6	1 346.2
Tunisia	186.0	87.9	144.5	418.4	139.1	-	243.9	35.4	418.4	5.8	0.5	424.7
Turkey	466.3	191.7	444.4	1 102.4	278.2	-	508.5	315.7	1 102.4	32.2	16.6	1 151.2
Uganda	94.2	56.8	9.8	160.8	97.1	-	58.0	5.7	160.8	16.6	-	177.4
UAR	242.4	253.0	511.0	1 006.4	231.1	0.8	438.1	336.4	1 006.4	69.5	38.3	1 114.2
USA	-	-	2.6	2.6	-	-	2.6	-	2.6	-	-	2.6
Uruguay	79.6	100.8	29.2	209.6	76.8	-	93.1	39.7	209.6	38.3	8.2	256.1
Venezuela	101.6	30.7	171.5	303.8	25.2	-	141.8	136.8	303.8	11.0	12.9	327.7
Viet-Nam	55.1	65.9	83.3	204.3	31.4	-	88.6	84.3	204.3	5.4	5.2	214.9
Yugoslavia	135.5	181.0	623.5	940.0	383.5	-	370.5	186.0	940.0	18.4	18.8	977.2
Zambia	37.2	25.5	-	62.7	6.4	-	56.3	-	62.7	10.9	-	73.6
Sub-total	8 869.7	5 464.4	11 567.3	25 901.4	7 390.9	11.6	11 547.0	6 951.9	25 901.4	1 516.3	624.4	28 042.1
<u>International projects</u>												
Africa	49.3	32.8	11.8	93.9	91.4	2.5	-	-	93.9	3.5	-	97.4
Americas	181.6	62.4	111.1	355.1	304.8	12.1	36.6	1.6	355.1	31.3	-	386.4
Asia and the Far East	200.8	56.9	60.4	318.1	312.2	3.8	2.1	-	318.1	26.5	-	344.6
Europe	21.0	18.6	17.3	56.9	56.9	-	-	-	56.9	-	-	56.9
Middle East	5.8	1.2	5.3	12.3	12.3	-	-	-	12.3	-	-	12.3
Inter-regional projects	382.4	219.4	965.8	1 567.6	882.7	6.8	612.2	65.9	1 567.6	47.9	-	1 615.5
Trieste Centre	-	-	210.0	210.0	-	-	210.0	-	210.0	-	-	210.0
Sub-total	840.9	391.3	1 381.7	2 613.9	1 660.3	25.2	860.9	67.5	2 613.9	109.2	-	2 723.1
<u>Miscellaneous</u>												
Bank charges	67.3	-	-	67.3	22.1	-	45.2	-	67.3	-	-	67.3
Mobile laboratories storage	-	6.5	-	6.5	-	-	6.5	-	6.5	-	-	6.5
GRAND TOTAL	9 777.9	5 862.2	12 949.0	28 589.1	9 073.3	36.8	12 459.6	7 019.4	28 589.1	1 625.5	624.4	30 839.0

<sup>a/</sup> Assistance in kind can only be estimated; see Introductory Notes, paras 4 and 5, to this Annex.

A N N E X II

REGIONAL AND INTERREGIONAL PROJECTS: 1970

Title	Place and dates	Source of funds	Participation <sup>1/</sup>		
			(1)	(2)	(3)
Interregional training course on medical application of radioisotopes	Khartoum, Sudan, 17 January to 11 February	UNDP(TA)	10	-	5
Interregional training course on maintenance and repair of nuclear electronic equipment	Turin, Italy, 16 March to 12 June	UNDP(TA) and regular programme	24	-	-
Regional training course on the use of isotopes and radiation in entomology	Turrialba, Costa Rica, 20 April to 29 May	UNDP(SF)	16	2	2
Interregional training course on the use of isotopes and radiation in animal science	Zemun, Yugoslavia, 4 May to 12 June	SIDA	14	-	1
Study tour (seminar) on in vivo radio-isotope measurement techniques in medicine	CSSR, Denmark, Sweden, USSR, 11 May to 27 June	UNDP(TA) and regular programme	15	-	-
Interregional training course on nuclear techniques in the mining industry	Cracow, Poland, 8 June to 4 July	UNDP(TA)	13	-	6
Interregional training course on the use of isotopes and radiation in animal science	Ithaca, USA, 20 July to 4 September	Regular programme	18	-	-
FAO/IAEA group fellowship study tour on the use of isotopes and radiation in agricultural research	USSR, 4 August to 3 September	FAO	14	-	-
Study tour (seminar) on the industrial application of radioisotopes and radiation	Canada and USA, 8 August to 19 September	Regular programme	18	-	-
Interregional training course on the use of isotopes and radiation in soil/plant nutrition studies	Wageningen, Netherlands, 10 August to 25 September	Regular programme	19	-	-
Interregional advanced summer school on reactor physics	Herceg Novi, Yugoslavia, 31 August to 10 September	UNDP(TA)	24	27	39
Interregional training course on uranium ore analysis	Madrid, Spain, 7 September to 27 November	UNDP(TA)	16	-	6
Regional training course on industrial radiation processing	Tokyo and Takasaki, Japan, 5 October to 13 November	UNDP(TA)	15	-	2
Regional training course on radiation dosimetry	San Juan, Puerto Rico, 5 October to 25 November	UNDP(TA)	9	-	-
Advanced regional training course on plans and procedures for radiation emergencies	Buenos Aires, Argentina, 9 November to 20 November	UNDP(TA)	12	2	10
Interregional training course on nuclear law	Athens, Greece, 7 December to 18 December	Regular programme	10	-	8
Research and demonstration project on isotopes in animal parasitology	Kabete near Nairobi, Kenya, 1970	UNDP(TA)	3	-	-
Training and demonstration programme on advanced atomic energy technology	Asia and the Far East, 1970	UNDP(TA)	18	-	492
Training and demonstration programme on advanced atomic energy technology	Europe and the Middle East, 1970	UNDP(TA)	25	-	-
			293	31	571

<sup>1/</sup> The figures under (1) denote the number of award holders whose cost of participation was met out of project funds; those under (2) denote the number of participants who attended at the expense of the Government, another organization or programme, and those under (3) denote the number of local participants - no stipends or travel costs are payable out of project funds in respect of their attendance.



A N N E X III

IAEA ISOTOPE HYDROLOGICAL SERVICES: UNDP(SF) SUB-CONTRACTS IN 1970 [1]

<u>Country or region and project number</u>	<u>Title</u>	<u>Cost of services provided</u>
Afghanistan AFG-4	Ground-water investigations (United Nations)	\$ 660
Algeria ALG-9	Natural resource surveys, agricultural experimentation and demonstration in the Hodna Region, Central Algeria (FAO)	900
Greece GRE-17	Study of water resources and their exploitation for irrigation in Eastern Crete (FAO)	3 400
Morocco MOR-17	Hydro-agricultural development of the Souss Valley (FAO)	1 160
Nicaragua NIC-8	Ground-water investigations in the Central Pacific coastal region (United Nations)	1 970
Africa Regional REG-79	Survey of the water resources of the Chad Basin for development purposes (FAO)	2 450
Africa Regional REG-100	Survey of ground-water resources in the Northern Sahara (UNESCO)	1 400
		<u>\$ 11 940</u>

[1] The organization for which the sub-contract was carried out is given following the project title.

