International Atomic Energy Agency

FIFTH WORKING GROUP MEETING OF RCA MEMBER STATES

DHAKA, BANGLADESH

11 - 16 MAY 1983

SUMMARY REPORT

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FIFTH WORKING GROUP MEETING
OF RCA MEMBER STATES

Dhaka, Bangladesh
11-16 May 1983

SUMMARY REPORT

The 5th Working Group Meeting of Member States of RCA (Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology) was held 11 to 16 May 1983, in Dhaka, Bangladesh, hosted by the Government of Bangladesh. A list of participants of the meeting is attached as Appendix 1.

Dr. Anwar Hossain, Chairman, Bangladesh Atomic Energy Commission, in welcoming the delegates on behalf of the Host Government, traced the history of RCA and hoped that the meeting would result in pragmatic programmes in keeping with the resources and abilities of the Region. His statement is attached as Appendix 2.

Professor Maurizio Zifferero, Deputy Director General, Department of Research and Isotopes, IAEA, presented the opening remarks with a statement setting forth the current status and the significant progress achieved in RCA activities during the past year, as well as identifying important items of the agenda to be discussed during the course of the meeting. The statement is attached as Appendix 3.

Air Vice Marshal Sultan Mahmud, Minister for Energy and Mineral Resources, Government of Bangladesh, inaugurated the meeting with a statement that it is timely to consider the establishment of a Regional Centre in an RCA country since RCA has been steadily growing during the past eleven years. The statement is attached as Appendix 4.

Dr. M. Mizanul Islam of the Bangladesh Atomic Energy Commission presented a vote of thanks on behalf of the Local Organizing Committee for the Working Group Meeting; it is attached as Appendix 5.

Following the opening of the meeting, Dr. Anwar Hossain was formally elected Chairman of the Meeting.

The provisional schedule for the meeting was accepted. It is attached as Appendix 6.

Agenda Item I

Progress of Regional Cooperative Research Projects 1982-83

A summary of progress in 1982-83 and the current status of RCA research projects was presented by the IAEA Secretariat. The summary, along with the progress reports of all research projects, is attached as Appendix 7.

The IAEA Secretariat reported that significant progress had been achieved in all projects. Four new projects in the field of Medical and Biological Applications of Nuclear Techniques, which were recommended by RCA/11, have been approved by the Director General of IAEA and are now being implemented. The IAEA's regular research programme budget and special contributions by the Government of Japan are being used to fund these projects.

A new project on "Basic Science using Research Reactors", which was proposed by the Government of India and recommended by RCA/11, has been approved by the Director General and is now in force. This project is funded by the special contribution of the Indian Government.

The Representatives of Governments party to RCA expressed satisfaction with the progress made to date on all projects.

The Representative of Bangladesh expressed his pleasure at the continuation of the project on "Health-Related Environmental Research", and requested the Agency to supply reference materials of dietary items, including rice, fish and milk for intercomparison studies in 1984. The IAEA Secretariat stated that consultation with the Scientific Officer for this Project will be taken up in Vienna upon the request of the Bangladesh Representative.

The Representative of India pointed out the importance of preparing a Code of Practice for radiation sterilization of medical products, to accelerate its commercialization in developing countries, and urged the IAEA to publish the Code of Practice as soon as possible. The IAEA Secretariat stated that the establishment of the Code of Practice is an important objective of the Radiation Sterilization Project and it should be published at the earliest possible time by IAEA.

The Representative of Bangladesh pointed out that, in his country, the Yellow Mosaic Virus (YMV) is a very serious disease and presents a much greater danger in soybean production than rust.

The Representative of Bangladesh also urged the early circulation of the Revised Recommended International Standard and Code of Practice for Food Irradiation by the Codex Alimentarius Commission (CAC), to promote the commercial use of food irradiation in Bangladesh. The Representative of India informed the meeting that the Revised Code of Practice has not yet been approved by the CAC.

Agenda Item II

Progress of the UNDP Industrial Project 1982-83

A summary statement was given by the IAEA Secretariat on behalf of the Project Director of the Regional UNDP Project for Asia and the Pacific (RCA) on Industrial Applications of Isotopes and Radiation, concerning the current status, progress and future plans. The summary, along with the status report of the Project, is attached as Appendix 8.

The Project Office will be opened on 1 July 1983, at the Centre for the Application of Isotopes and Radiation (CAIR), BATAN, Jakarta, Indonesia. The Tokyo Office will accordingly be closed as of 30 June 1983. IAEA/UNDP are completing action leading to the appointment of a new Project Director to become effective 1 July 1983.

The Project Senior Board of Advisors was appointed on 9 September 1982. The Board, which is composed of five members, has overall responsibility for the Project. The first meeting took place in Jakarta, 4-5 November 1982, and the second meeting will be held in Ban Pong, Thailand, 2-4 June 1983.

The total Project budget for 1983 is US$2,759,668, which includes UNDP funds and the contributions of the participating Governments as follows:

		(in US$)
1.	UNDP	
	a. Experts and consultants	33,526
	b. Training	204,420
	c. Equipment	573,305
	d. Administration	56,000
	e. Miscellaneous	5,000
	TOTAL	872,251
2.	Participating Governments	1,887,417
	GRAND TOTAL	2,759,668

The Representatives of participating Governments expressed satisfaction with the progress made to date and the current status of the UNDP Industrial Project.

The Malaysian Representative urged that IAEA/UNDP should appoint the successor of the UNDP Project Director as soon as possible for a smooth transfer of responsibilities. The DDG-RI, IAEA, stated that IAEA/UNDP are holding final consultations with the participating Governments and a formal announcement will be made soon.

The Representative of Bangladesh urged an increase in the number of trainees under the sub-project "Nuclear Instrument Maintenance" in view of the importance of this field. The IAEA Secretariat stated that it is not easy to increase the number of trainees due to budget limitations and the limited capacity of hosting instrument manufacturers in Japan. It was pointed out by the Secretariat that another on-the-job training course will be given in 1984. The Representative of Japan stated that his Government would make every effort to increase the capacity for receiving trainees subject to the availability of additional UNDP funds.

The Representatives of India and Pakistan stated that they had not received the announcement letter for the first training-demonstration on Nuclear Control System Use in the Mineral Industry, scheduled for 18 August 1983 to 31 March 1984, in Australia and the Philippines, and urged the IAEA to submit the letter immediately. In this connection, the

Representative of Pakistan stated that his Government should receive the announcement letter from IAEA three months before the training is scheduled, to facilitate nomination of candidates and internal procedures.

Agenda Item III
1983 RCA Action Plan and 1984 Cost Projection

The 1983 RCA Action Plan was presented by the IAEA Secretariat as set forth in Appendix 9. The total budget for the RCA projects in 1983, as submitted to the Director General, was in the amount of US$3,448,238. The budget for research projects was in the amount of US$572,000, and that for the UNDP Industrial Project was US$2,876,238. The research projects on Hydrology, Research Reactor Utilization and Food Irradiation are funded by the Governments of Australia, India, and Japan resprectively. Financial resources for the UNDP Industrial Project are from UNDP funds, special contributions in cash and in kind from RCA Governments, and contributions from industries in RCA countries.

A draft of the 1984 cost projection was explained by the IAEA Secretariat, and is attached as Appendix 10.

The total estimated cost for research projects is US$921,500, including training activities (US$180,000). Costs for research contracts and meetings for 1984 exceed the 1983 level by about 30%.

The Representatives of RCA Governments expressed their great appreciation of the IAEA's continuing financial support to RCA and urged its strong support for the activities planned for 1984. Following the discussions, the proposed activities for 1984 as outlined in Appendix 10, were accepted.

The Chairman asked about coordination between the Department of Research and Isotopes and the Department of Technical Cooperation, IAEA, in RCA activities. The DDG-RI stated that the involvement of the Technical Cooperation Department in RCA is increasing and should be further increased in the future. The UNDP Industrial Project is handled by an office in the Department of Technical Cooperation. The training activities planned and equipment required for the project on Medical and Biological Applications of Nuclear Techniques should be supported by the Technical Cooperation funds through appropriate coordination with the Technical Cooperation Department.

The Chairman pointed out that the total cost for 1984 had decreased from 1983 by US$724,000, due to the cost decrease for the UNDP Project because procurement of major equipment has been accomplished in 1982 and 1983. The cost for other projects has increased by about 60%.

The Representative of Bangladesh enquired as to the reasons for the reduction in cost of the Project on Hydrology and Sedimentology, and expressed his serious concern with the significant reduction in this important project activity. The IAEA Secretariat explained that the Government of Australia has been supporting the Project since 1979 and terminated its cash contribution and financial support by the Government of Australia has been shifted to the Mineral Exploration and Processing Project during 1983, so that IAEA will fund the hydrology activities through its regular research budget in 1984. The DDG-RI stated that he understood that the projected cost for the 1984 activity in hydrology should be sufficient under present circumstances.

The Representative of Australia stated that it was his understanding after the Research Coordination Meeting for the Hydrology Project held in 1982, that the development phases in the participating countries had been accomplished and that they are now, to some extent, self-supporting.

In view of the importance of this project, the increase in funding after 1984 through the support of IAEA and/or RCA Governments was particularly emphasized by the Representatives of Bangladesh, India and Pakistan.

The Chairman recommended that the IAEA could organize a regional seminar on hydrology to review the current status and exchange views among RCA countries. He also suggested to IAEA to arrange a mission to survey common problems related to hydrology and sedimentology in RCA countries.

Agenda Item IV
Future Programme and New Proposals

1. Medical and Biological Application of Nuclear Techniques

A revised project proposal on "Medical and Biological Applications of Nuclear Techniques" was outlined by the IAEA Secretariat. (Appendix 11).

The proposal includes four major sub-projects:

1. Improvement of radiation therapy in cancer
2. Nuclear medicine in liver and thyroid diseases
3. Nuclear techniques for diagnosis of parasitic diseases
4. Preparation of Tc-99m generators, radiopharmaceuticals and radioimmunoassay kits.

It consists of three phases, namely

Phase I - Cooperative research projects, 1983-85

Phase II - Training programmes for technology transfer, 1984-87

Phase III - Setting up of a centre for training, 1986-89.

In accordance with a request by RCA Governments, the IAEA Secretariat submitted the above proposal to the Asian Development Bank for their partial financial support. However, the IAEA Secretariat has recently been advised that the Asian Development Bank is currently not in a position to support the project because of their restricted budget.

The IAEA Secretariat reported that Phase I of this project is now being implemented through the IAEA regular research budget, and training courses planned for 1984 have been submitted to the Department of Technical Cooperation for approval.

The Representative of the Republic of Korea stated that, in order to reduce the cost for equipment used in a training centre, a network system using existing institutes in RCA countries as centres of excellence may be more appropriate, and offered the expertise and equipment available at KAERI for training programmes in cancer therapy.

The Representative of India expressed his support, in general, of the revised proposal, and suggested that high priority should be given to the training activities. He also pointed out the urgent importance of training in "remote after-loading technique" for therapy of uterine cancer which is very prevalent in the majority of RCA countries. He suggested that the frequency of the training courses on nuclear medicine could be reduced to once every two years to save project cost and that medical doctors and physicists trained in the courses can in turn train people in the field in their respective home countries.

The Indian Representative also emphasized the importance of the project on nuclear techniques for tropical parasitic diseases, such as malaria and filariasis, in developing countries.

The Representative of Bangladesh supported the statements made by the Indian Representative, in particular those concerning the importance of the training-the-trainers programme and the integration of training on radio-immunoassay kits and radiopharmaceuticals. He also proposed that his Government would be willing to host one training course on "Nuclear Techniques for Tropical Parasitic Diseases".

The Representative of Bangladesh suggested the integration of a compact cyclotron to produce short-lived isotopes for medical use in the list of equipment for the planned Regional Centre.

The Representative of Japan stated that his Government strongly supports the projects "Medical and Biological Applications of Nuclear Techniques" and, in particular, he emphasized the importance of cancer therapy and nuclear medicine. An outline of his statement is attached as Appendix 12.

The Representative of Japan also expressed that his Government supports the establishment of a regional centre for training, and announced that a remote after-loading machine for uterine cancer therapy will be donated by the Government of Japan through IAEA to accelerate the establishment of the centre. The DDG-RI and the Chairman, on behalf of the Representatives, expressed their appreciation of the generous offer made by the Government of Japan.

The Representative of Malaysia expressed strong interest in the establishment of the regional training centre in Kuala Lumpur and stated that there is already basic equipment such as LINAC, CT, and Betatron in Kuala Lumpur which can be integrated into the centre.

The Representative of Japan announced that a study meeting on "Radiation therapy and related subjects" will be held in Japan, 11 August - 25 September 1983, organized by the Japan International Cooperation Agency (Appendix 13). The Representative of India urged that the announcement of the study meeting should also be circulated through IAEA to RCA countries so that the atomic energy authorities of RCA countries can take quick and appropriate action. It was agreed that both the Government of Japan and the IAEA will give positive consideration to this request.

The meeting concluded that Phase I and Phase II are strongly supported by the Representatives, but that Phase III should be further studied in terms of availability of equipment and advantages over network systems among centres of excellence.

2. Utilization of Research Reactors

The Representative of India proposed a three-week workshop on the use of microprocessors in research reactor utilization (Appendix 14) in view of the importance of microprocessors and computers. This is consistent with IAEA's planning for this project. The workshop will be held at the Bhabha Atomic Research Centre in October or November 1983, with ten to twelve participants from RCA countries. The main emphasis will be on the practical experience for hardware selection and software design. The DDG-RI, IAEA expressed his appreciation that the Indian Government has picked up one of the proposals made by IAEA.

The Representatives of Pakistan and Bangladesh commented that it is worthwhile for the Indian Government to support the activities more directly related to the utilization of research reactors, such as neutron scattering, although the importance of microprocessors cannot be questioned.

It was pointed out by the Indian Representative and the IAEA Secretariat that the RCA research project on neutron scattering had, after seven years, been terminated.

The Representatives noted, however, that new research reactor facilities would soon become available in some of the Member States and the revival of coordinated research activities in neutron beam research should be considered.

It was recommended by the Chairman and accepted that in the above mentioned workshop, special lectures and case studies will be given on the use of microprocessors for neutron scattering.

The Representative of Malaysia stated that IAEA's Seminar on Utilization of Research Reactors will be held in November 1983 and proposed an RCA workshop on the same topic to take place in conjunction with the seminar to exchange views on future promising applications and activities in this field. This proposal was accepted subject to the availability of funds.

The Chairman suggested that the workhop in India may take place in October/November 1983, followed by the IAEA seminar in Malaysia in November 1983, with some common participants, so that, if possible, a continuing programme may be established in the utilization of research reactors.

3. Food Irradiation

The IAEA Secretariat explained the proposal for Phase II of the Food Irradiation Project (Appendix 15), the major objectives of which are to evaluate the commercial feasibility of irradiation treatment of fishery products, tropical fruit, onions and spices, and to promote technology transfer to the relevant food industries in RCA countries. It was reiterated that the Phase II proposal submitted to the Asian Development Bank for partial financial support had not been successful.

The Representative of Bangladesh expressed his appreciation of Japanese financial and technical support for the Food Irradiation Project during the past three years and strongly urged continuation of the support for Phase II of the project up to 1987.

The Representative of Bangladesh explained the Bangladesh proposal for a Food Irradiation Centre set forth in Appendix 16. It was stated that the proposal is well combined with the Phase II proposal of IAEA by installing a pilot-scale food irradiation plant in Bangladesh. There are three possible sources of funds, namely national funds, UNDP funds, and bilateral assistance. Bangladesh will submit a request to UNDP through IAEA under the country programme, but wants additional support of RCA countries. All relevant facilities mentioned in the proposal will be the contribution from Bangladesh.

The Representative of Japan stated that his Government agreed to a one-year extension of the Food Irradiation Project up to August 1984, without additional funding.

The Representative of Japan also stated that both the Phase II proposal of IAEA and the Bangladesh proposal should be examined based on recommendations of the expert mission in June 1983 and the final report of the on-going project.

The Representative of India supported the Bangladesh proposal and commented that estimated costs of US$1 million for the irradiation facility are too low and should be re-estimated. He also suggested that the proposed

irradiation facility should be used for demonstration of medical product sterilization and animal feed irradiation.

The Representative of India pointed out that the most serious bottle-neck in the Phase II proposal and the Bangladesh proposal is a lack of funds. In this connection, the IAEA Secretariat stated that if no funds are available, medium size irradiators existing in some of the RCA countries for medical product or other product treatment could be used for this project in the meantime. The Representative of India suggested that the cost component for irradiators should then be excluded to decrease the cost of Phase II. The irradiation facility for the Bangladesh proposal can be funded through bilateral assistance from UNDP or any other source and may be used for Phase II activities when it is installed.

4. Domestic Buffalo Production Improvement (Phase II)

It was proposed that Phase II of the Domestic Buffalo Production project will be started with particular emphasis on the studies regarding buffalo diseases and interaction between nutrition and reproductive efficiency in the period 1984-88. The proposal was accepted by the Representatives. Extension of the project to cattle was suggested by the Bangladesh Representative.

The meeting urged that funds for the project on "Nuclear Techniques for Biogas Conversion from Agricultural Residue" should be made available.

5. Other New Proposals

Reutilization of Agricultural and Agro-industrial Residues through Nuclear Technology

The Representative of Bangladesh proposed a cooperative research project on "Reutilization of Agricultural and Agro-industrial Residues through Nuclear Technology". The objective of this research project is to develop a technology to convert agricultural and agro-industrial residues such as bagasse and molasses from the sugar industry to alcohol through the use of radiation and industrial micro-organisms.

It was stated by the IAEA Secretariat that several groups, including a group from JAERI, are conducting research in the above field. They have found that alcohol can be efficiently produced from agricultural wastes by using enzyme immobilized by irradiation and that pre-irradiation of cellulosic waste increases the yield of alcohol. It was also stated by the IAEA Secretariat that as part of an on-going IAEA coordinated research programme on "Radiation Technology for the Immobilization of Bioactive Materials", radiation immobilization of enzyme and its application for biomass conversion is being carried out and RCA Member States are welcome to participate.

The Representative of Malaysia also emphasized the importance of the technique to utilize agricultural residue in his country.

It was proposed by the Representative of Bangladesh and agreed by the Representatives that a draft proposal will be prepared by Bangladesh to be presented at RCA/12 in October 1983 for consideration.

Commercial Irradiation Centre

The Representative of Pakistan stated that his Government has a strong interest in setting up an irradiation centre with 300 KCi Co-60 source in Pakistan, to promote the transfer of radiation technology to relevant industries such as medical products and wood (Appendix 12), and he urged the support of RCA countries to their proposal requesting UNDP assistance. The Representatives supported the Pakistan proposal in view of their increased contribution to RCA activities through the setup of the centre.

Training Programme on Isotope Production

The Representative of Bangladesh stressed the importance of isotope production in developing countries and asked whether it would be possible to organize a training course under the RCA programme on Research Reactor Utilization.

The Representative of India commented that for isotope production, long-term on-the-job training under the IAEA fellowship programme will be more effective than short-term training courses to achieve the experience and competence required for appropriate manpower.

Agenda Item V
Country Statements

All Representatives presented country statements on the current status, progress and future prospects of RCA activities, as attached in Appendix 18.

The Representative of Australia formally stated that his Government will contribute a sum of A$655,000 over the five-year period 1983-1987 to the project on "Nucleonic Control Systems for Mineral Exploration, Mining and Processing", under the RCA/UNDP Industrial Project.

The Representative of Japan formally announced that his Government will make a cash contribution of US$300,000 to RCA in 1983.

The DDG-RI expressed his appreciation of the generous offers of the Governments of Australia and Japan, on behalf of IAEA and the RCA countries.

Agenda Item VI
Other Business

The Representative of India formally offered to host the 6th Working Group Meeting of RCA Member States in 1984 and this proposal was accepted by the Representatives. The date was tentatively fixed as 14-19 March 1984.

The Representative of Pakistan offered to host the 7th Working Group Meeting of RCA Member States in Pakistan in 1985.

The Representative of the Republic of Korea informally offered to host the 8th RCA Working Group Meeting in Seoul in 1986.

Final acceptance of the offers by the Governments of Pakistan and the Republic of Korea will be discussed at RCA/12.

Agenda Item VII
Confirmation and Acceptance of the Meeting Report

The Representatives accepted the draft Summary Report of the 5th RCA Working Group Meeting.

The Representatives expressed their thanks to Dr. Machi and Dr. Fowler, who will be leaving the IAEA Secretariat at the end of May and end of June, respectively, for their efforts and hard work on behalf of RCA.

In his concluding remarks, the Chairman summarized the discussions held. He remarked that the most important aspect of RCA is the academic nature of RCA activities and the atmosphere of cooperation among RCA countries. He emphasized that we must keep in mind the application of research programmes without sacrificing quality and while remaining within the terms of reference.

The Chairman especially thanked Professor Zifferero and the staff of the IAEA Secretariat, in particular the Department of Research and Isotopes and the Department of Technical Cooperation, for their support of RCA activities. He remarked that the most important part of any such endeavour is the meeting of minds and the exchange of ideas. The Chairman thanked the delegates and the local Organizing Committee for their cooperation throughout the meeting to make it a great success.

The 5th Working Group Meeting of RCA Member States was adjourned at 13:15 hours on 16 May 1983.

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5TH WORKING GROUP MEETING OF RCA MEMBER STATES

DHAKA, BANGLADESH

11-16 May 1983

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Appendix 2

FIFTH RCA WORKING GROUP MEETING

DHAKA, BANGLADESH

11-16 MAY 1983

Address of Welcome

by

Dr. Anwar Hossain
Chairman, Bangladesh Atomic Energy Commission

and

Chairman, Organizing Committee

Air Vice-Marshal Sultan Mahmud, Prof. Zifferero, Honourable Delegates, Excellencies, Distinguished Guests, Ladies and Gentlemen

On behalf of the Organizing Committee, I welcome you all to the inaugural ceremony of the 5th Working Group Meeting of the Regional Cooperative Agreement (RCA) of the International Atomic Energy Agency in this historic city of Dhaka. We are very fortunate that, in spite of his busy schedule, the DCMLA and Minister for Energy and Mineral Resources, Air Vice-Marshal Sultan Mahmud has kindly graced the meeting with his presence for which we thank him whole-heartedly. We are also thankful to Professor Zifferero, Deputy Director General of IAEA and his colleague, Dr. Machi, RCA Coordinator, who have provided much help to hold the meeting in Dhaka. I warmly welcome the distinguished representatives of the RCA countries who have come here for the meeting. We have taken the liberty of inviting principal investigators of the various RCA programmes in Bangladesh to attend the meeting, so that they can learn from the deliberations of the distinguished nuclear scientists that have come from abroad. Perhaps they can contribute ideas too.

Eleven years ago, in Mexico City, where the 16th Regular Session of the General Conference of IAEA was being held, the idea of getting interested Asian and Pacific countries together on programmes of common concern in the peaceful application of Atomic Energy, was mooted. I was present there. The Conference started by admitting Bangladesh as a Member State of IAEA and soon afterwards I was involved in the discussions that led to the formation of RCA. It was decided that similar research programmes, especially in the field of agriculture, would be taken up simultaneously in some Asian Member States of IAEA, and that IAEA would organize regional meetings to exchange experiences. Thus RCA was born, with a limited budget of IAEA and local counterpart funds, and a mandate to continue the programme for five years. We are glad to report that RCA has already crossed two five-year periods and is now in its third term. From my personal experience of the expanding activities of RCA, I am sure that RCA has come to stay permanently, thanks to the support given by IAEA, its Director General and the successive Deputy Directors General in charge of Research and Isotopes, not the least, Professor Zifferero, who has personally come here and will speak before you next. I would also gratefully acknowledge the generous contributions of UNDP, Japan and Australia to this effort. From a meagre beginning, the budget of RCA is now $3,505,317 for 1983, with a 4-year projection of $8,709,699 for 1983-1986, which is the largest academic programme of IAEA. In fact, it is now envisaged that such programmes will be extended to Latin America and other continents.

Let me now say a few words about the present programme of RCA. The programme includes coordinated research projects in various aspects of agriculture, health, food irradiation, maintenance of nuclear instruments, and application of tracer technique in hydrology. Considerable progress has so far been made in all the research projects and it is expected that their applications will aid the national development of RCA countries. The recently introduced UNDP industrial project on the application of isotopes and radiation technology aims at providing training of nuclear scientists and industrial experts in the fields of non-destructive testing, tracer technology, radiation processing of rubber, cable and wood, nucleonic control systems in paper and steel industries, and mineral exploration, radiation sterilization of medical products and nuclear instruments maintenance. It is hoped that training in these fields will help to facilitate technology transfer within the RCA countries on the basis of regional cooperation.

I am glad to say that a programme for research reactor utilization has been taken up by the RCA, which will be discussed during the ensuing business sessions. I would like to thank the Government of India for their offer of $50,000 for this RCA project, for the training of nuclear scientists in the utilization of research reactors. The project is very timely for us as we are now going to install our own research reactor at the AERE, Savar. IAEA is organizing a seminar on the effective utilization and management of research reactors in Kuala Lumpur in November of this year. I would like to request the IAEA to hold a broadly-based regional conference on nuclear and reactor physics in November-December, 1984, when our neutron generator and research reactor will be fully operational.

Ladies and Gentlemen, we have now come together in Dhaka to review our past activities and to formulate the future programmes so that the benefits of the peaceful application of atomic energy can accelerate the economic development of the region. The intention has been to pool the common knowledge and to make the best use of nuclear techniques with our limited resources.

In Bangladesh, we are committed to the peaceful application of atomic energy to improve the lot of common man, especially in matters of food, health, agriculture, industry and in developing related techniques. We strongly believe in regional cooperation and have recently hosted the research coordination meeting of the RCA project on Maintenance of Nuclear Instruments from 29 November to 3 December 1982. The potential of nuclear science and

technology is inexhaustible and our ingenuity is the limit of its applications. From our past records, we can safely say that we have not lacked in ideas. Supported by international bodies, the rich and technically advanced countries can go a long way in putting our ideas into action. I would also like to state that our feet are very much on the ground. We shall use the latest technologies to solve the most urgent needs of the RCA countries and we shall mean business in the course of the 5th RCA Working Group Meeting and hope to come up not with magic formulas but pragmatic programmes in keeping with our resources and abilities. This does not mean that we shall hesitate to take bold steps. Modern research has come a long way from the days of Galileo and Newton. Individual efforts have given way to teamwork and now we have come to a stage when regional efforts are needed to solve problems and that is what we are trying to do within the framework of RCA.

I would once again thank everyone who is participating in this morning's session, especially our guests from abroad, to whom I wish a pleasant stay in Dhaka.

FIFTH RCA WORKING GROUP MEETING

ADDRESS

by

PROFESSOR M. ZIFFERERO
DEPUTY DIRECTOR GENERAL
INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, AUSTRIA

Excellency,

Chairman Hossain, Distinguished delegates and guests from RCA Member countries, Ladies and Gentlemen.

It is my great honour and pleasure to address the 5th RCA Working Group meeting here in Dhaka, the capital of Bangladesh, one of the most active RCA countries.

I would like to join Chairman Anwar Hossain in welcoming all the representatives from countries party to RCA in Asia and the Pacific.

I would also like to express the appreciation of the IAEA to the Government of Bangladesh for hosting this meeting and to congratulate the BAEC staff for the excellent arrangements they have made to this effect.

According to an established tradition which has been followed during the past RCA Working Group meetings, I would like to briefly review the progress of the programme during the past twelve months and talk about its prospects for the future.

The 1983 consolidated budget for RCA activities has reached the level of US$3,448,000, which represents 2.6% of the total consolidated Agency's budget.

A major part of the budget, namely US$2,759,668, relates to the so-called UNDP industrial project.

The amount earmarked for research activities is US$572,000. This sum will come from the Agency's research programme and from special contributions from the Governments of Australia, India and Japan. The Agency's contribution amounting to US$397,000 represents an increase of about 12% over the budget for 1982.

I am pleased to report that the ongoing projects have made considerable progress as reflected in the summaries prepared for this meeting by the scientific officers.

It is also very significant, and a sign of the vitality of RCA, that four new projects in the field of medical and biological applications of nuclear techniques have been approved and are now funded in the 1983 Action Plan.

This new area of activity has actually met the interest of the majority of RCA countries and is likely to be further expanded in the future. In this connection we were recently informed that in order to encourage the establishment of a brachytherapy demonstration centre in an RCA country, the Government of Japan will donate a high-dose remote after-loading piece of equipment suitable for the radiotherapy of cervix cancer.

The UNDP Industrial Project has been steadily progressing in most of its sub-projects. In fact, a large-scale demonstration plant for radiation vulcanization of natural rubber latex has almost been completed and will reach the commissioning stage by July of this year.

Training courses on non-destructive testing and nucleonic control systems for the paper industry have taken place in Singapore, Thailand, and Japan.

A nucleonic control system for the steel industry was installed in India in May of this year.

The temporary UNDP Project Office in Tokyo has been operating since June 1982 and will close on June 30 of this year when the new permanent Project Office will be officially opened on the first of July at the Centre for Applications of Isotopes and Radiation, BATAN, Djakarta, Indonesia. The offer of the Government of Indonesia to host this office is very much appreciated.

I would like at this time to express our sincere gratitude for the continuing special contributions of the Governments of Australia and Japan. In addition, the Government of India has generously offered to fund activities related to more basic science and to the utilization of research reactors. Already, the first training workshop on technetium-99m generator

systems, which took place in Trombay in March of this year, was funded through this contribution.

Encouraging as it may be, this increase in resources is not, however, sufficient to cover all planned programmes. A shortage of funds is likely to affect the implementation of the second phase of the food irradiation project and still does not allow the launching of the project on biogas from agricultural residues which has been approved, in principle, by RCA countries.

I would, therefore, take this opportunity to urge your Governments to continue and, if possible, to expand their contribution and support to RCA activities.

In connection with the food irradiation project, a possibility of continuing beyond 1984 could be linked in some way with the proposal, submitted recently by the Government of Bangladesh, that the planned BAEC pilot plant food irradiation facility be considered as a possible future focal point for RCA activities in this field.

Before concluding, I would like to recall that in August of last year a group of high-ranking officers of some Latin American Atomic Energy Commissions paid a visit to RCA countries to get a first-hand impression of the development of our initiative and with the objective of starting a similar arrangement in Latin America.

The outcome of that visit was very positive and a report on it was presented at a special meeting attended by all Latin American country representatives in Vienna.

As a follow-up, Venezuela, Colombia, Ecuador, Peru and Bolivia (the so-called Andean group) have now agreed on a number of research areas to be covered by the future Latin American RCA.

This indeed provides an additional proof of the validity of the Recional Cooperation concept and IAEA will stand ready to assist in establishing coordinated projects patterned after your successful model, also in other regions of the world.

I would like now to conclude and invite delegates to make the best possible use of this week of close contacts. This is really the best occasion, once a year, to pause and take stock and, at the same time, to look ahead to the future evolution of RCA.

FIFTH RCA WORKING GROUP MEETING

INAUGURAL ADDRESS

by

Air Vice Marshal Sultan Mahmud, B.U. ACSC
Deputy Chief Martial Law Administrator
and
Minister for Energy and Mineral Resources
Government of the People's Republic of Bangladesh

It gives me great pleasure to be here with you this morning to inaugurate the Fifth Working Group Meeting of the Regional Cooperation Agreement (RCA) of the International Atomic Energy Agency (IAEA). On behalf of the Government of Bangladesh, I would like to express my warm welcome to all the distinguished delegates, who have chosen to grace the city of Dhaka. I hope your stay and discussions will be fruitful for the establishment of a more effective regional cooperation in the peaceful application of nuclear science and technology. I would also like to thank the International Atomic Energy Agency and the RCA Member Countries for selecting Dhaka as the venue for such an important meeting.

From the time this Agreement was conceived of some eleven years ago, the RCA activities on regional cooperation have come a long way. I would like to express my appreciation to the International Atomic Energy Agency for their efforts in developing Nuclear Science on a regional cooperation basis in this part of the world.

Bangladesh has been participating in all the RCA Projects and I would like to assure you of our Government's desire to support such regional cooperation.

You are, I am sure, aware of the research activities of the Bangladesh Atomic Energy Commission (BAEC), which is engaged in the peaceful application of atomic energy in the fields of agriculture, medicine, industry and other areas of interest to the nation.

I am happy to say that the BAEC is now entering the second phase of its programme by establishing modern scientific laboratories at its establishment at Savar. The principal facility is going to be a research reactor, which is scheduled to be operational by this time next year. The installation and operation of the reactor will indeed be a technical achievement for BAEC.

In the field of Radiation Biology, the Atomic Energy Commission has successfully carried out studies on preservation of food and sterilization of medical equipment. The Institute has at its central facility a 50,000 Curie gamma irradiator.

The Atomic Energy Commission did some pioneering work in the introduction of computer science in the country. And I am glad that they are now in the process of setting up a computer of the 4th generation at the AERE, Savar.

The Institute of Electronics has already started functioning. In addition to research and development in the field of electronics instrumentation, the Institute is providing valuable services for repair and maintenance of electronics instruments, which is very important for a research organization.

One of the most important aspects of the work in which BAEC scientists are engaged is in the field of health physics and environmental monitoring. In fact, it is for this activity that nuclear regulatory bodies are essential and the Government is soon going to introduce necessary legislative measures for radiation protection and nuclear safety.

Exploration of uranium and thorium resources is also going on in the country. Radioactive anomalies have been discovered in some areas of Sylhet, Chittagong and Chittagong Hill Tracts. Beach sands at Cox's Bazar have shown deposits of heavy minerals which can be commercially exploited.

The Commission is also planning the establishment of nuclear power plants to meet the acute electricity needs of the country. To this end, the total energy requirements of the country are constantly being assessed and studies are being undertaken to explore possible alternative sources of energy, especially the renewable ones. Perhaps we, the Asian countries, could put our ideas together in this vital area and find a way out of the present energy crisis.

I would now like to take this opportunity to put forward a proposal for establishing a Regional Centre for RCA countries under the auspices of the IAEA. As you all know, the IAEA has already established three centres in Vienna, Trieste and Monaco in collaboration with the host countries, in specific areas of atomic energy. Since the activities under the RCA have been growing during the last 11 years for the betterment of regional

cooperation, it is most timely to consider the establishment of a Regional Centre in an RCA country, where all the participating Member States may cross-fertilize their ideas in research, development and training. We shall be happy to host such a Regional Centre in Bangladesh which is geographically located at a very central place of the RCA countries. For this purpose, the Government of Bangladesh will be ready to offer the facilities of the AERE, Savar at the disposal of the RCA. As a first step, one could consider setting up a food irradiation centre at the Institute of Food and Radiation Biology, with a central facility of a 200,000 Curie gamma irradiator. I understand that a proposal in this regard has already been submitted by the Bangladesh Atomic Energy Commission and I expect that this will receive your due consideration.

I hope that the Fifth RCA Working Group Meeting will provide our local scientists an opportunity to meet and discuss with their counterparts subjects of mutual interest and future programmes.

With these words, I declare this Meeting open and wish you all success in your deliberations.

Vote of thanks by Dr. M. Mizanul Islam,
Member-Secretary, Organizing Committee.

Mr. Chairman, Air Vice-Marshal Sultan Mahmud, Prof.Zifferero, Honourable Delegates, Excellencies, Distinguished Guests, Ladies and Gentlemen,

It is my proud privilege to offer vote of thanks to you all on behalf of the Organizing Committee of the 5th RCA Working Group Meeting. My thanks are particularly due to Prof. Zifferero, Dr. Machi and the Delegates of the RCA countries who have come here to attend this meeting. The Organizing Committee wishes them a very hearty welcome and hopes that they will enjoy the visit to Dhaka in addition to having fruitful discussions on the RCA programme. To you, Mr. Minister, we are most grateful for your joining us this morning to inaugurate the meeting. Your presence will invariably inspire us in our activities in research and development related to Nuclear Science and Technology for which the RCA was created. We are very much thankful to the International Atomic Energy Agency and the Governments of the RCA Countries for choosing Dhaka as the venue for this Working Group Meeting and for offering us the honour to host it.

We are thankful to the Energy Division, Ministry of Energy and Mineral Resources for their support in organizing this meeting. We are grateful to the local UNDP Office for their help and to the authorities of Hotel Sonargaon for providing the facilities both for the inaugural session and for the business sessions.

I shall also take this occassion to thank the news media for attending and covering the function.

My special thanks are due to Dr. Anwar Hossain, Chairman, Bangladesh Atomic Energy Commission for his constant and valuable guidance without which organization of the meeting would not have been possible. Finally, I would like to thank

all Members of the Organizing Committee and Subcommittees and all those who have not been mentioned but helped us in many ways to make the conference a success.

Inspite of all our efforts there might have been some drawbacks on our part for which I hope you all will execuse us. But I can assure you from our heart that we shall continue to try our best to make the meeting a success with your cooperation.

Thank you all again.

I.A.E.A.

FIFTH RCA WORKING GROUP MEETING

May 11—16, 1983
Dhaka, Bangladesh

B.A.E.C

PROVISIONAL SCHEDULE

May 11 (Wednesday)	9.00	Inaugural Session
	10.00	Election of Chairman Adoption of Agenda
		I. Progress of Regional Cooperative Research Projects in 1982/83
		II. Progress of the UNDP Industrial Project in 1982/83
	12.30	Lunch Break
	14.00	III. 1983 RCA Action Plan and 1984 RCA Cost Projection
	15.30	Tea Break
	16.00	IV. Future Programme and New proposals 1. Medical and biological application of nuclear techniques (revised proposal)
May 12 (Thursday)	9.30	IV. Future programme and New proposals (Cont'd) 2. Utilization of research reactors (Indian proposal)
	10.30	Tea Break
	11.00	3. Food Irradiation 4. Buffalo production improvement
	12.30	Lunch Break
	14.00	V. Country statements on RCA Projects by Representatives of 13 Member States.
	15.30	Tea Break
	16.00	VI. Country Statements on RCA Project (Cont'd)
May 13 (Friday)		Free
May 14 (Saturday)		Sight Seeing Tour
May 15 (Sunday)		Visit to the laboratories of (i) Atomic Energy Research Establishment, Savar. (ii) Institute of Nuclear Medicine, Dhaka. (iii) Atomic Energy Centre, Dhaka.
May 16 (Monday)	10.00	VII. Other Business VIII. Confirmation and acceptance of meeting report Closing Remarks
	12.00	Adjournment

Appendix 7

STATUS REPORTS OF COOPERATIVE RESEARCH PROJECTS

1982/83

SUMMARY PROGRESS REPORT OF RCA PROJECTS

1982-83

OUTLINE

1. The 11th Meeting of Representatives of RCA Member States was held at the Hofburg, Vienna, on 21 September 1982, chaired by Prof. M. Ghazali of Malaysia. The report of the 4th RCA Working Group meeting was accepted to serve as the Report and Recommendations of RCA/11.

2. The 1983 RCA budget in the amount of US$3,448,238 has been approved by the Director General. The budget for research project is US$572,000 and that for the UNDP Industrial Project is US$2,876,238. Sources are from the IAEA Regular budget, UNDP funds and special contribution from RCA countries.

3. The four projects on "Medical and Biological Applications of Nuclear Techniques" which were recommended at RCA/11 for the Agency to implement, have been approved by the Director General and are now in force.

4. The project on Food Irradiation is expected to be extended up to Augsut 1984. The second phase of the project is under consideration.

5. The interim RCA/UNDP Industrial Project Office was opened in Tokyo in June 1982 and will be closed June 30, 1983. The permanent office will be located in Jakarta and will start operating on 1 July 1983. The first meeting of the Senior Board of Advisors was held November 4-5, 1982 in Jakarta.

6. RCA/12 is scheduled to take place during the IAEA General Conference (October 10-14, 1983) in Vienna.

FOOD IRRADIATION

A research coordination meeting and the 3rd Project Committee were held 22-26 November 1982 in Bangkok, hosted by the Government of Thailand.

The reports presented at the RCM provided promising results on the feasibility of food irradiation for the following:

a. Sprout inhibition of onions

b. Preservation and sanitation of dried fishery products

c. Insect disinfestation and shelf-life extension of mangoes

d. Insect disinfestation and microlidal decontamination of spices.

Technological and economical feasibility of food irradiation, including packaging, shipping and economic analysis, will be investigated in the coming year.

It was recommended by the Project Committee and it is expected that the Project will be extended until August 1984.

An expert mission to evaluate the status of RPFI objectives and the national potential for commercialization of food irradiation will be dispatched in June 1983.

IMPROVEMENT OF DOMESTIC BUFFALO PRODUCTION

Since the previous RCM (April 1982) research work has continued along the three major lines, namely buffalo reproduction, nutrition and disease, and a considerable amount of useful information has been obtained. The final research coordination meeting will be held in June 1984, probably in the Philippines. The second phase of the Project will start in 1984 for another five years.

STERILIZATION OF BIOLOGICAL TISSUE GRAFTS

The Project on Radiation Sterilization is taking a new direction, namely the study and establishment of a technology for the sterilization of various tissue grafts for safe clinical use in reconstructive surgery. These tissue grafts include bone, nerve, cartilage, skin dressing, heart valves, etc.

HEALTH-RELATED ENVIRONMENTAL RESEARCH

The results of intercomparison studies of various reference materials based on powdered human hair were evaluated and published in the Journal of Radioanalytical Chemistry. The final report of the intercomparison will be published in 1983.

Analysis of various biological and environmental sampels for trace elements continued to be carried out by the participants to investigate specific environmental health problems of local significance. Samples analysed by various participants included human specimens (blood, urine, hair, nails), dietary items (rice, fish, milk), and drinking water. The results showed that there was no dangerous contamination.

The Project will continue to be implemented through 1984. Existing research contracts and research agreements will continue to be supported accordingly.

MAINTENANCE OF NUCLEAR INSTRUMENTS

All the participants continued their activities. Viet Nam joined the project, but no research contracts have as yet been concluded.

Major progress was made in the following fields and directions:

- Power conditioning
- Air conditioning
- Maintenance plans and their execution
- Training
- National actions
- Related activities

IMPROVEMENT OF GRAIN LEGUME PRODUCTION

In 1982, the third research coordination meeting was held at the Korean Advanced Energy Research Institute in Seoul. The exchange of experiences was most useful. Particular emphasis in the discussion was placed upon the relevance of plant architecture for grain yield and yield supporting characteristics. Soybean rust continues to be a major threat to soybean production in the tropics, but virus diseases are becoming more and more serious as well, suggesting more and intensified efforts for disease resistance breeding.

ISOTOPE APPLICATIONS TO HYDROLOGY

Progress on this project was reviewed at a meeting held at the Research Establishment of the AAEC at Lucas Heights, Australia, 1-5 Nov. 1982. All countries party to the Project, except Bangladesh, were represented at the meeting. The review was considered under two main headings. The first concerned the coordinated programme of research applying environmental isotope techniques to hydrological problems in Indonesia, Malaysia, the Republic of Korea and Thailand; and the second concerned the present status of operational and planned environmental isotope analytical facilities.

It should be remarked that the direct cash contribution of the Australian Government ceases during 1983, so that in 1984 the project will be implemented with reduced funding by the Agency.

SEMI-DWARF MUTANTS FOR RICE IMPROVEMENT

The direct utilization of induced semi-dwarf mutants to develop new varieties of rice for cultivation has already given good results in Japan and the USA. Therefore, with good reasons this programme aims at the evaluation of semi-dwarf mutants as parents in cross-breeding and providing alternative gene sources for semi-dwarfness in different genetic backgrounds. The coordinated research programme was initiated by the Agency and implemented in 1982. The programme is currently participated in by scientists from six countries, namely Thailand, India, Pakistan, Bangladesh, Indonesia, and the Philippines.

A first step the project has taken was to start agronomic evaluation of a large number of semi-dwarf mutants, and the genetic analysis of mutants has begun.

SUMMARY REPORT OF THE ASIAN REGIONAL PROJECT ON FOOD IRRADIATION (RPFI)

(June 1982 - March 1983)

I. FAO/IAEA Research Coordination Meeting (RCM) on the Asian Regional Cooperative Project on Food Irradiation (RPFI) and the Third RPFI Project Committee Meeting

Both meetings were hosted by the Department of Agriculture, Ministry of Agriculture and Cooperatives and were held at the Rama Tower Hotel, Bangkok from 22 to 26 November 1982. The RCM was attended by twelve scientists who are research contract or agreement holders, from nine member countries of RPFI, plus fifteen other local and foreign scientists who are associated with the project. The reports presented at the RCM provided valuable and promising information on technological and economic feasibility of application of food irradiation for:

— sprout inhibition of onions;

— preservation and sanitation of dried and cured fishery products;

— insect disinfestation and shelf-life extension of mangoes;

— insect disinfestation and microbial decontamination of spices.

It was concluded that certain information on technological and economic feasibility of food irradiation such as packaging, shipping trials, economic analyses of results, is still required before commercial application could be realised. These aspects of work will be carried out in the coming year.

The Third RPFI Project Committee meeting was held from 24 to 26 November 1982, and was attended by representatives of seven countries, i.e., India, Indonesia, Japan, Republic of Korea, Malaysia, Pakistan and Thailand. Scientists from other RPFI countries who attended the RCM also attended this meeting as observers. The Project Committee considered both administrative and technical aspects of the Project in the past year. Special emphasis was given to the possible extension of the Project. It was noted that approximately US$81,000.- was still available from the Project funds contributed by the Government of Japan at the time of the meeting. This amount of money was originally foreseen to carry out the activities of the Project until its expiration date, i.e., 27 August 1983.

In view of the encouraging results obtained under the RPFI and the recent breakthroughs in terms of legal acceptance and applications of food irradiation, representatives of Participating Governments of the RPFI expressed their strong desire to continue the activities of the Project in order to achieve conclusive results as well as to be able to decide whether a second phase of the Project (technology transfer) should be commenced. Therefore, the Participating Governments strongly recommended the extension of the Project by one year, i.e., from 28 August 1983 to 27 August 1984. In view of this, the Project Committee recommended:

(a) that the IAEA should request the Participating Governemnts of the RPFI to prepare and send to the project secretariat, not later than 1 May 1983, a report on present status of national programmes and planned activities towards practical application of irradiation on commodities selected for the RPFI studies.

(b) that the IAEA consider sending an expert mission around June 1983 to selected RPFI countries for an independent evaluation of the status or development in RPFI objectives and national potentials of commercialization of the particular irradiation processes.

(c) that the existing unobligated funds of the Project be used for:
- financing the mission proposed under (b);
- supporting studies on clarifying the presently unsettled feasibility questions and further work towards up-scaling the promising applications;
- convening an RCM to discuss the final results of the present Project.

It is planned to submit the reports and findings mentioned above to the Annual RCA meeting to be held during the General Conference in October 1983 for consideration and support of Phase II of the RPFI.

II. Cost Projection (until August 1984)

	US$
1. Cash in Hand (as of 31 December 1982)	81,486.36
2. Expenditures (estimated)	
2.1 Research contracts	38,500.00
2.2 Expert mission	20,000.00
2.3 Research Coordination Meeting	24,000.00
Total	82,500.00

Status Report

FAO/IAEA Co-ordinated Research Programme
on Semi-dwarf Mutants for Rice Improvement
in Asia and the Pacific (RCA)

The direct utilisation of induced semi-dwarf mutants to develop new varieties of rice for cultivation has already given good results in Japan and the USA. Therefore, with good reasons this programmes aims at evaluation of semi-dwarf mutants as parents in cross-breeding and providing alternative gene sources for semi-dwarfness in different genetic backgrounds.

The co-ordinated research programme was initiated by the Agency and implemented in 1982. In the programme currently scientists from six countries participate as follows:

2839/RB	P. Pookamana	- Rice Research Institute Bangkok, Thailand
2986/RB	E.A. Siddiq	- IndianAgric. Research Inst. New Delhi
3116/RB	T.P. Reddy	- Osmania University Hyderabad, India
3118/RB	M.A. Awan	- Nuclear Inst. of Agric. & Biology Faisalabad, Pakistan
3119/RB	G. Bari	- Atomic Energy Agric. Research Centre Tandojam, Pakistan
3125/RB	R. Sumanggone	- Centre for the Application of Isotope & Radiation, Jakarta
3156/RB	A.J. Miah	- Inst. of Nuclear Agriculture Mymensingh, Bangladesh
3249/RB	M.M. Miah	- Bangladesh Rice Research Inst. Dacca, Bangladesh
3250/RB	T.S. Eugenio	- Maligaya Rice Research & Training Centre Nueva Ecija, Philippines

As first step this project has started agronomic evaluation of a large number of semi-dwarf mutants, and the genetic analysis of mutants began. These studies on the possible utilisation of semi-dwarf mutants as cross breeding material take into account the agro-ecological conditions of the respective countries.

The first research co-ordination meeting is planned to be held in October 1983 at the International Rice Research Institute in the Philippines. The present status of use of induced semi-dwarf mutants in hybridization programmes will be discussed and conclusions and recommendations will be drawn up for the next stages of research.

Work plan and budget for 1984

The individual mutation breeding projects will continue and it can be expected that some advanced improved material from previous radiation treatments of local varieties will undergo further agronomic evaluation. New mutants might also be induced. Most of the contracts will require the same support in 1984 as before. A few additional contracts might be concluded.

12 contracts @ 4000	48000. -
research coordination meeting	25000. -
	73000. -

Status Report
FAO/IAEA Coordinated Research Programme on
the Use of Induced Mutations for Improvement of Grain
Legume Production in South East Asia

In 1982, the third research co-ordination meeting was held at the Korean Advanced Energy Research Institute in Seoul. The meeting was joined by researchers from other parts of the world aiming in a similar way at genetic improvements of grain legumes for developing high yielding and disease resistant cultivars. The exchange of experiences was most useful. Particular emphasis in the discussion was placed upon the relevance of plant architecture for grain yield and yield supporting characteristics. Soybean rust continues to be a major threat to soybean production in the tropics, but virus disease become more and more serious as well, suggesting more and intensified efforts for disease resistance breeding. The present programme with its modest support plays mainly a catalytic role and is of value in developing technology and methods. Member States will definitely have to strengthen their national efforts in order to secure sufficient and safe supply of pulses, which are such a nutritious food, particularly valuable for the poorer part of the population that cannot afford meat or prefers vegetarian food.

We will give the breeders time to advance their projects and postpone the next research co-ordination meeting till early 1984.

Budget plan 1984

No change in budget is foreseen in 1984

12 contracts @ 4000	48000
Research Coordination Meeting	25000
	73000

Use of Nuclear Techniques to Improve Domestic Buffalo Production in Asia

(a) Progress (April 1982 - 1983) and Present Work Plan

Since the previous Research Coordination Meeting (Malaysia, April 1982) work under the programme has continued along three main avenues, i.e. buffalo reproduction, nutrition and disease.

Work on reproduction has continued to characterise the reproductive capacity of different breeds of buffalo and in different countries with a view to gaining an understanding of the causes of the long-recognised low reproductive capacity of these animals. The use of radioimmunoassay techniques, in particular progesterone analysis, has been identified as a suitable tool for monitoring the reproductive status of buffaloes. Working assays for this and other hormones involved in the control of reproduction have been established in 6 countries contributing to the programme. These assays have now been used to establish the hormonal profiles for different breeds of buffalo during oestrus cycles, pregnancy, parturition and the post-partum period, and the results have been correlated with ovarian morphological changes examined by laparoscopy. The data generated from this work clearly point to the fact that progesterone RIA has helped substantially to improve the clinical skills in determining reproductive status. Other work which has been initiated in this general area includes: the introduction of endocrine methods for oestrus synchronisation and of hormone administration to advance the onset of post-partum cyclicity; and in bulls, studies are underway to clarify the relationships between hormone levels, libido and semen characteristics.

In the area of nutrition, considerable information has now been obtained on the utilisation of straw-based diets for buffalo, and on the beneficial effects on digestibility of treatment with urea. This has been a major breakthrough in the programme. Not only is urea treatment the most feasible for Asian farmers, but it is also an inexpensive N source, providing fermentable N at no extra cost. Furthermore, it has

been shown that ensiling of straw with urea increases the weight gain of growing animals by 60% and milk yields by 80-100%. In addition, isotope-based studies are underway on the use of urea/molasses in straw-based diets; on the use of sweet potato hay and fishmeal as supplements for straw-based diets; and on the effects on productivity of feeding a number of agro-industrial by-products available in the Region, e.g. rice bran, soyabean meal and leucaena.

Finally, isotope-based studies on the pathogenesis, immunology and control of Toxocara vitulorum infections are now defining the nature and sequential development of the clinical disease, the nature of the host response to the parasite, and effective chemotherapeutic strategies for the control of the infection in calves.

This programme will have been operational for approximately 5 years by the end of 1983, and without doubt it has been highly successful. Already it has helped to increase buffalo productivity through improved management practices derived from research findings. It has also enhanced substantially the level of expertise as well as the educational quality within many University Departments and Research Institutes; it has encouraged close contact between scientists within and outwith the Region; and it has promoted information exchange on an animal which is vital to the interests of the Region's small farmers and agricultural industry.

The final RCM will be held in January 1984 (probably in the Philippines). At this meeting, final reports will be presented by all contributors to the programme. In view of what is already acknowledged as the high quality of the work, IAEA will be requested to publish these reports in the priced Panel Proceedings Series.

(b) Future Plans

To achieve its goals a follow-up programme entitled "Use of Nuclear Techniques to Improve Domestic Buffalo Production in Asia - Phase II" should be initiated early in 1984. Such a programme would have 3 specific goals. Firstly, it would aim to strengthen inter-disciplinary

studies, e.g. work on the interaction between reproductive efficiency and nutrition. Secondly, it would aim to fill the important gaps which remain within some of the disciplinary work. For example, work on buffalo diseases has been restricted to studies conducted under 1 Research Contract and consequently less progress has been made in this area than in e.g. reproduction; this situation would be remedied under Phase II. And finally, efforts would be made to encourage those countries which have not participated in the first programme to initiate isotope-aided research under Phase II. It is proposed that continuation of isotope-aided work on the buffalo would extend over the period 1984-1988 and would include 12-15 Research Contracts/Agreement holders with approximately 3 Coordination Meetings (in 1985, 1987 and 1988).

(c) Funds Required for 1984

*Final Coordination Meeting (likely venue: Philippines)..$25,000
12 Research Contracts at $5,000 each (Phase II).....$60,000

*This meeting was originally scheduled for 1983, but for budgetary reasons was moved to 1984.

RCA REPORT ON RADIATION STERILIZATION OF MEDICAL SUPPLIES

The Agency's Co-ordinated Programme of Research (CPR) on Radiation Sterilization of Medical Supplies suited to the local conditions for the RCA countries in Asia and the Far East is participated by Australia, Bangladesh, India, Indonesia, Korea (South), Pakistan, Philippines and Thailand. The Agency's CPR has recently phased out upon successful completion of its objective goals.

The CPR has dealt with a review of the local medical supplies amenable to sterilization practices by ionizing radiation (Market survey). As the successful implementation of the sterilization practices including dose-setting criteria rely to a large extent upon the initial levels of contamination which needs to be eliminated through the sterilization process, the CPR group focussed attention on the estimation of this aspect (i.e. bio-burden).

The bio-burden involves the quantitative estimation of the number of contaminants per medical item under consideration and their identification in particular terms of their radiation response which should influence the recommended acceptable sterilization dose.

Among the participating countries of the CPR Australia has developed guidelines for good manufacturing practices (GMP) and India has formulated such a document in keeping with its local conditions which is currently under review by the responsible national authorities concerned. All other participating countries have developed relevant microbiological and radio-biological data pertaining to their radiation sterilization practices through the research supported by the CPR and in this approach have made uses of the already available data/experiences in the field to provide necessary model systems as guides.

In course of the standardizing exercises carried out under the work schedule of the Agency CPR (RCA programme) the group dealt with (i) inter-comparison of the methods followed by each individual national institutes in isolating the contaminants from medical items (bio-burden estimation)

and (ii) intercomparison of the sterilizing efficiency parameters of their respective irradiator facilities used in the co-ordination study (sterilizing dose). As the currently practiced sterility safety assurance level (SAL) for the sterile medical supplies accepted by the national health regulatory authorities of the RCA countries concerned conforms to 10^{-6} (or one surviving microorganism per one million processed medical items) and accordingly the minimum sterilizing radiation dose of 2.5 Mega rads, these criteria continued to be used as standards for practices development and for the level of safety assurance.

Studies were carried out byall the CPR participants to deal with the inactivation efficiency of microbiological standard preparations (Bacillus pumilus E601) and the determination of decimal reduction factor or D_{10} value (i.e. the dose of radiation required to eliminate 90% of the population). The Microbiology Laboratory of the Australian Atomic Energy Commission at Lucas Heights kindly offered to conduct this intercomparison survey under an IAEA supported Technical Contract. The survey revealed some major sources of discrepancy in the methodologies followed by some of the participating laboratories which could be subsequently corrected through exchange of information.

However, some isolates from cotton samples in Bangladesh showed extreme radioresistance as revealed by the high estimated D_{10} value of around 0.5 Mega rad. If substantiated further, such a medical item would require the delivery of a sterilizing radiation dose far higher than the generally accepted level of 2.5 Mega rad to conform to the sterility safety of 10^{-6}. Subsequent investigations on the validation of this radioresistant contaminant either as the true isolate survivor from sub-sterilizing incremental dose series on the cotton samples or a false positive originating from other extraneous source(s) could not be unequivocally established.

The work schedule of the RCA/CPR included studies on the irradiation sterilization practices for some pharmaceutical formulations. These included some antibiotic preparations, hydrocortisone eye ointments and other items of topical clinical use. Satisfactory conditions for their irradiation in dry solid state and the freedom of the finished products from unacceptable levels of degradation derivatives were enunciated. Recommendation of sterilization practices for pharmaceuticals depended on their conformity with the pharma-

copoeal specification standards for safe clinical use. The studies also included physical/chemical/radiation chemical aspects of sterilizing radiation treatment of plastic formulations for packaging as well as pharmaceutical containers.

In conclusion, the studies carried out under the RCA programme/CPR have helped provide local expertise and specific technical data on the development of safe practices for sterilization of medical supplies in local use in their health care and thus to up-grade the standards of their health-care services. Furthermore, in the spirit of the regional co-operation a cohesive scientific/technical international body has been formulated to aid peaceful uses of atomic energy to ensure health standards and should accrue continual benefit-sharing through future co-ordination functions.

Future Outlook for the RCA Programme

Evaluation of the radiation sterilization practices for tissue grafts and establishment of tissue banking.

Research and experiences in the countries of North America and Europe have satisfactorily established the feasibility of the use of radiation for sterilization of various tissue grafts for safe clinical use in re-constructive surgery. These include bone, nerve, cartilage, "skin dressing", fascia lata and dura mater, among others. Providing appropriate conditions and radiation environment these tissues could be radiosterilized to the required level of safety assurance for use in the clinical practices. It is desired that such sterile grafts should be produced in sufficient quantities to be stored in the tissue banks. Some such centralized facilities could facilitate the works of surgeons concerned of specified disciplines who could request for and receive supplies as per need to provide health care services. These facilities are currently not available in the countries of Asia and the Far East and are in great demand. These could help remedy many debilitating health disorders and alleviate patient sufferings and thus could contribute to the national productivity and progress by trans-formation of the disabled as a "national burden" into a productive manpower resource.

Currently some efforts are underway in the countries of the regions, such as Burma and the Philippines. Requests have been made by Bangladesh and Burma to the Agency's Technical Co-operation programme for assistance to help establish tissue banks. It is recommended that the field of application should be supported by the initiation of an RCA/CPR of the Agency. The scope of the programme could be further extended by using the experiences and models of the Technical Co-operation programmes as carried out in Burma and Bangladesh. The last meeting of RCA Member States representatives reviewed such a recommendation and approved its inclusion in the future RCA programme schedule.

A co-ordination programme of research under the RCA is thus foreseen to be developed to deal with the safe practices for radiation sterilization of tissue grafts to sustain their clinical use. It is estimated that about ten to twelve research contracts and agreements would be supported under this programme and a budget of U.S.$ 30,000 would be allocated to support such research activities and their periodic reviews at the research co-ordination meetings.

RCA PROJECT ON HEALTH-RELATED ENVIRONMENTAL RESEARCH

INTRODUCTION

The primary objective of this Project is to develop and validate useful analytical methodologies in the participating laboratories for the assessment of environmental and human contamination with mineral pollutants. Elements of primary interest include heavy metals, cadmium, mercury, lead and arsenic.

PROJECT'S STATUS FOR 1982

Investigators from the following countries are actively participating in the Project: Bangladesh, India, Indonesia, Japan, Malaysia, New Zealand, Pakistan and Singapore. Two individual projects were completed in 1982 (Thailand and Korea). A new proposal submitted by Korea is expected to be recommended for approval and implementation.

One practical way to realise the Project's objective is an active participation of the laboratories concerned in intercomparison studies of various reference materials. Results of an intercomparison study of a reference material based on powdered human hair, HH-1, were evaluated and published in the open literature (J. Radioanal.Chem. 69 (1-2) (1982): 171-180). A final report on this intercomparison is to be issued in 1983. A new intercomparison study involving 3 certified reference materials was organized in 1982. An evaluation of the results is to be done in 1983 and a report will be published.

Analysis of various biological and environmental samples for trace elements continued to be carried out by the participants to investigate specific environmental health problems of local significance. Samples analysed by various participants included human specimens (blood, urine, hair, nails), dietary items (rice, fish, milk), and drinking water. The results showed that there was no dangerous contamination.

Publication of the Project's Newsletter reporting experimental details, results and other developments in research areas of interest to the participants, continued to be supported.

PROPOSED ACTION PLAN FOR 1984

The Project will continue to be implemented through 1984. Existing research contracts and research agreements will continue to be supported, accordingly.

Intercomparison studies of new reference materials will be organized.

It is planned to hold a regional training course in nuclear techniques for environmental and occupational studies.

The current Project will phase out in 1984 and a new Project will be proposed, whose primary objective will be the assessment of mercury and other heavy metals in fish.

ESTIMATED BUDGET FOR 1984

The activities proposed above can probably be implemented successfully within the budgetary limits envisaged for the 1984-1987 period. However, additional funds will be necessary for the planned regional training course if this proposal is approved for implementation.

Contracts	US $ 50,000
Reference Materials	US $ 4,000
Research Co-ordination Meeting	US $ 20,000
Total	US $ 74,000

CRP ON "Development of Tc-99m Generators Using Low Power Research Reactors"

1. INTRODUCTION

The goal of this CRP is to develop an appropriate technology for the preparation of Tc-99m generator systems using low specific activity Mo-99 produced in low power research reactors, and suitable to be used in the environment of a radiopharmaceutical unit of a hospital.

Letters were sent out to all Member States of the region currently in possession of a nuclear research reactor, inviting them to present formal proposal for participating in the Agency's Coordinated Research Programme. The following scientists are currently in the programme:

Dr. Boyd, Research Agreement, Australia
Dr. Mani, Research Agreement, India
Dr. Zahiruddin, Research Contract, Indonesia
Mr. Prakongvong, Research Contract, Thailand.

In the near future, it is expected to conclude research contracts with scientists from Bangladesh, Malaysia and the Republic of Korea.

2. FINANCIAL PLAN FOR CRP

1984

- Five research contracts	$15000
- One coordination meeting (Proposed either Republic of Korea or Indonesia)	$15000
- Supply of generator prototypes	$10000
Total	$40000

1985

- Five research contracts	$15000
- One coordination meeting (Proposed either Malaysia or Thailand)	$15000
- Supply of generator prototypes	$10000
Total	$40000

Workshop on "Tc-99m Generators and Their Utilization", Bombay, India, 7 to 10 March 1983.

Using a special contribution by the Government of India to the RCA programme for Asia and the Pacific, a Workshop was organized by the Agency together with the Radioisotope Group of Bhabha Atomic Research Centre (BARC) in Bombay. All Member States of the region were formally invited to submit nominations. Unfortunately, due to the short notice given, only five participants from Indonesia, Malaysia, Singapore, Thailand and Vietnam attended, plus three participants from India.

The aim of the Workshop was to review and discuss the most recent developments in the production of Tc-99m generators using low power research reactors and to provide the corresponding training for their proper utilization to scientists of the region.

The lectures as well as the laboratory exercises and demonstrations were well prepared in advance by the local staff of the Radioisotope Group. Furthermore, for the benefit of the participants, a well written and edited manual containing useful technical information was also prepared.

With the exception of the participant from Singapore, all the participants were senior scientists actively engaged in the production of radioisotopes in their home countries. The Workshop provided them with the opportunity to learn more of the recent developments on the Tc-99m technology, in particular, some technical details and operations of the Tc-99m solvent extraction generator developed at BARC. This generator can be easily adapted to the conditions prevailing in other developing countries because it utilizes only inexpensive natural molybdenum of low specific activity.

During the Workshop, the author of this report delivered a lecture on the Cyclotron Production of Radioisotopes, which was attended by the Workshop participants as well as the local scientists.

During discussions with the local organizers of the Workshop, Dr, Iya, Head of the Radioisotope Group, suggested that future contributions to the RCA programme by the Government of India should be only used for training and not for the purpose of supporting research contracts or coordination meetings. In this connection, it was agreed, tentatively to organize a specialized training course in 1984 on "Hospital Radiopharmacy". This course may be held either in India or Thailand. A proposal in this direction will be put forth by the Indian representative to the upcoming RCA meeting, which is to be held in Dhaka in May.

CRP - Nuclear Techniques for Tropical Parasitic Diseases: Progress Report for the 5th RCA Working Group

The above CRP has not been started since arrangements have not been completed on the supply of monoclonal antibodies and on the organization of the assays. The Walter & Eliza Hall Institute at Melbourne was unable to supply monoclonal antibodies for the programme and the Pasteur Institute at Lille (France) and the WHO Immunology Centre at Geneva have been approached as alternatives. Although both have agreed in principle to supply the reagents, written confirmation is awaited.

Letters have also gone out to Dr. Sundaram and Dr. Samuel at BARC, Bombay, requesting their agreement to use the BARC as the Central Laboratory for the CRP, and again here, confirmation is awaited.

It is expected, subject to agreements being received on the matters above, that the CRP proposal will go to CCSS in May, and the programme commence in September 1983.

Review of RCA Project on the Maintenance of Nuclear Instruments 1979-1982

April 1983

1. Participants

All the participants continued their activities. Vietnam joined the project, but did not yet conclude a research contract.

2. Initial year of programme

The programme started with an Advisory Group Meeting held from 17 to 21 December 1979 in Kuala Lumpur, Malaysia in which 8 of the 9 future CSI's took part.

3. Initial programme goals

The objectives of the Programme are to improve the efficiency, reliability and quality of the work done in laboratories using nuclear electronic instruments in such disciplines as medicine, agriculture, environment, industry, veterinary sciences, hydrology, mining and education, through the introduction of more effective maintenance strategies and practices and the rationalisation of technical cooperation and training programmes related thereto.

In the short term the Programme aims at establishing maintenance strategies and practices in Pilot Laboratories which will serve as examples for other laboratories. The maintenance strategies are laid down in laboratory maintenance plans which concern conditioning of the instrument environment (dust, air, AC power), preventive maintenance, quality control, spare part supply, instrument repair, recording of instrument histories (logbooks), instrument procurement, training of personnel of all levels, streamlining of administrative rules and regulations and the management of all these actions.

The Programme aims also at the creation of centralized national maintenance facilities and expertise to assist individual laboratories in solving their instrument and spare part problems.

4. Progress to date

4.1. Power-conditioning

(a) The quality of the AC power supplied to the Pilot Laboratories was comprehensively monitored and conclusions were drawn as to the characteristics of the necessary power-conditioners.

(b) Power-conditioners consisting of drop-out relays, varistors (which limit the amplitude of transients) and constant voltage transformers were installed for several instruments in all pilot laboratories.

(c) A paper based on the above-mentioned experience has been prepared in draft and will be published.

(d) The lessons learned from this activity have been made known to, and brought into practice in, laboratories other than pilot laboratories.

4.2. Air-conditioning

(a) Extensive recordings of air temperature and relative humidity have been made in the Pilot Laboratories.

(b) The final evaluation of the data obtained cannot be made before the execution of further experiments. However, the existing air-conditioner systems and their use seem in most Pilot Laboratories insufficient to protect instruments from damage due to humidity.

(c) Window air-conditioners have proved to be dehumidifiers during cooling periods only but they are humidifiers when their cooling system is switched off.

(d) The experience gained with this activity is also shared with other laboratories.

4.3. Maintenance plans and their execution

(a) Apart from the environment-conditioning, which is an essential part of maintenance plans, actions have been undertaken to inventory instruments, to compile libraries of instrument manuals and other relevant documents, to formulate preventive maintenance and quality control protocols, to nominate persons responsible for instrument maintenance and daily care, to formulate descriptions of the tasks of such persons, to introduce instrument logbooks and to produce flowcharts on maintenance organization.

(b) Unfortunately the results of these actions were not very promising due to serious, mostly non-technical, problems which are encountered in maitenance planning and execution. The most important of these problems are:

b.1. lack of maintenance appreciation on the part of the administration, management and sometimes even instrument users;

b.2. lack of motivation on the part of, and co-operation among, instrument users, operators and maintenance staff;

b.3. lack of budget provisions for maintenance and spare parts;

b.4. lack of sufficient number of maintenance personnel often caused by brain drain to better paid jobs in private firms and in oil producing countries;

b.5. lack of skill in the maintenance of more sophisticated instruments;

b.6. frustration of the maintenance staff due to lack of co-operation of the administration.

(c) Despite these difficulties the CSI's possessed sufficient optimism to propose realistic plans to cope with these problems.

4.4. Training

(a) A seminar on the Maintenance of Nuclear Instruments was held in 1980 in Manila, Philippines.

(b) To promote national training courses a Train-the-Trainers Workshop was organised in 1981 in Kuala Lumpur, Malaysia, in collaboration with the RCA project on Industrial Applications in which teachers of all participating countries took part.

(c) As a follow-up of this workshop one or two national training courses for maintenance technicians and instrument users and operators have been given in 1981 and 1982 in all participating countries (in total 14 courses). In most countries courses are planned for 1983.

(d) Most of the subjects taught in these courses were covered by local teachers. However, an Agency expert gave some assistance in topics which could not yet be covered by local staff.

(e) Intensive discussions and study is progressing on the improvement and the adaptation of these courses to local conditions.

(f) A Regional Workshop on Microprocessors in Nuclear Instruments was conducted in BARC, Bombay, India, in 1983. The syllabus of this workshop was prepared in collaboration with the Project Officer, but the lectures and practicals were completely conducted by the staff of the Electronics Division of BARC.

4.5. National actions

In a few countries attempts are being made to set up central maintenance facilities. In all countries many more than only the Pilot Laboratories profit from the experience gained in this project.

4.6. Related activities

(a) An Interregional Technical Cooperation Project on the Maintenance of Nuclear Instruments, INT/4/054, has been established in which the countries participating in this programme take part.

(b) Under this project:

b.1. An itinerant expert has visited twice the Pilot Laboratories in six participating countries. He gave advice on their maintenance plans and assisted in the conduct of training courses. In 3 countries an expert of national TC projects assisted the programme.

b.2. Equipment for training courses and power-conditioning was provided which could not be supplied under the contracts.

b.3. The equipment for the Regional Microprocessor Workshop was supplied.

b.4. The project officer visited most of the Pilot Laboratories during his travels to and from the different meetings.

(c) This T.C. project has had a very positive influence on the Coordinated Research Programme.

(d) The yearly meetings and the regional training activities have greatly contributed to the success of the Programme.

4.7. Expenditure from November 1979 until December 1982

Contract funds:

			US$
(a)	Contracts		144,200
(b)	Coordination Meetings (3)		22,743
	Other funds:		
(c)	Advisory Group Meeting		19,500
(d)	Experts under T.C.	approx.	65,000
(e)	Equipment under T.C.	approx.	40,000
(f)	Additional travel of the Project Officer	approx.	5,000
(g)	Seminar	approx.	16,000
(h)	Train-the-Trainers Workshop	approx.	60,000

5. Future programme plans

5.1. The work on power-conditioning will be concluded.

5.2. Further experiments on air-conditioning will be executed and results evaluated. Recommendations will be made known to participating countries.

5.3. Main attention will be paid to the problems encountered with the administration and the management of the laboratories to enable the establishment of maintenance strategies.

5.4. Major efforts will be made to improve the local training courses.

5.5. In some countries a central maintenance facility will be realised.

5.6. A Spare Part Pilot Project will be set up.

5.7. Per year approximately US$ 50,000 will be needed for the contracts and US$ 10,000 for the Coordination Meeting. Additionally, the Interregional Technical Cooperation project will continue and a second Train-the-Trainers Workshop will be organised.

5.8. It is estimated that the project will take another 3 years to achieve its main goals.

6. This project which is a combination of a Co-ordinated Research Programme and Technical Co-operation activities has been more effective than TC activities alone. The Co-ordinated Research Programme creates the I-do-it-myself attitude needed to integrate maintenance, quality control and training in the regular workplan of the participating laboratories and countries. It enhances also a friendly rivalry among the participants through the regular reports and the yearly evaluation meetings. The Technical Co-operation assists the National Supervisors to overcome some major obstacles.

ISOTOPE APPLICATIONS TO HYDROLOGY AND SEDIMENTOLOGY

Progress April 1982 - March 1983

Progress on this project was reviewed at a meeting held at the Research Establishment of the AAEC at Lucas Heights from 1 - 5 November 1982. All countries party to the project, except Bangladesh, were represented at the meeting. The review was considered under two main headings. The first concerned the coordinated programme of research applying environmental isotope techniques to hydrological problems in Indonesia, Malaysia, Republic of Korea and Thailand; and the second concerned the present status of operational and planned environmental isotope analytical facilities.

With regard to the study in the region of Seoul, a large amount of data has now been collected which has clearly confirmed the initial findings from this study, namely that groundwater in the metropolitan of Seoul is recharged by infiltration of water from the Han River. This is in contrast to areas both upstream and downstream of the metropolitan area, where recharge is dominantly by infiltration of local precipitation. In the case of the study in the Jakarta basin, the results have provided a very interesting insight into the leakage of water from the deeper aquifer into the overlying, shallower aquifers. The stable isotope data have identified particular areas in the metropolitan area where this leakage is most marked, and in fact coincides with cones of depression in the water table. The second study in Malaysia, which centred in the Kedah Perlis area, was still at a preliminary stage and as yet no firm conclusions on the environmental isotope data can be made. However, it seems that the southern part of the basin appears to be characterised by more depleted stable isotope values and low tritium concentrations. More positive oxygen-18 values have significant tritium concentrations. These findings the occurrence of two types of water: one of recharge in the highlands (more negative ^{18}O and low tritium because of time of transit), and the other originating as local recharge. The study of the Bangkok basin has involved sampling from over 70 wells, where the isotope analyses have been made in the laboratories of the AAEC and the IAEA. Chemical analyses have been made in Thailand. The stable isotopic composition of groundwater from the central Bangkok area is characterised by enriched values, which are typical of an evaporation process in contrast to other groundwater samples, more removed from the central Bangkok area. This suggests that the waters in the central Bangkok area have been recharged by a similar mechanism, possibly at a time when the recharge area was flooded and covered by swamps. Carbon-14 data are consistent with the hypothesis that recharge occurs at the limits of the basin; an increase in age is observed from the north to the south of the basin.

Although there is no formal field project in Sri Lanka within the context of the coordinated research programme, field studies have commenced within the framework of the project, after the return of the project supervisor following an Agency fellowship at the AAEC. The studies have been directed to a limited general survey of the environmental isotopic composition of groundwaters in different parts of the country, and also to a specific project concerned with the cause of salinisation of groundwater.

The tritium laboratories both in the Republic of Korea and in Indonesia have now been operational for more than two years. All the requirements for tritium analyses from both these countries are being met by the laboratories which have been established under this project. Some problems have been encountered with the equipment, which were discussed at the meeting at Lucas Heights in November. It is pleasing to note that these problems were overcome in both cases by the local personnel and resources.

Plans are at an advanced stage for the installation of an environmental tritium analytical facility in Sri Lanka, Thailand and Malaysia. Advice has also been given to the Philippine Atomic Energy Commission, with regard to their intended plans for the installation of an environmental tritium laboratory. The advice was particularly concerned with the planned location of the laboratory in order to avoid problems of contamination from the swimming pool reactor.

The application of environmental Cs-137 to sedimentology was a later addition to this RCA Isotope Hydrology Project. Profiles have been measured for sites in Malaysia and also samples have been measured from the Song Khla lake complex in the south-east of Thailand. In both countries many of the required analyses have been made in the respective national facilities.

Projection for 1984

It should be remarked that the direct cash contribution of the Australian Government ceases during 1983, so that in 1984 the project will be implemented with much reduced funding. It is estimated that the coordinated research programme will require an expenditure of about $15,000. It should be noted however that there is as yet no operational stable isotope analytical facility in the region. This poses a severe constraint on the further development of these techniques in the region. Up to the present the laboratories of the AAEC and the Agency have provided the necessary support. It is hoped that some of the countries may be able to establish this capability and cooperate with the

other countries party to the project in the provision of assistance for these analyses.

RCA SUMMARY REPORT

1. Title: RCA Regional Project on Improvement of Cancer Therapy in Asian Countries by the Combination Treatment of Conventional Radiation and Physical or Chemical Means

2. Objectives: The co-ordinated programme aims at clinical studies on combination therapy of conventional radiation and physical and/or chemical agents under the co-operative work of this basic research and also expects to improve the radiation therapy techniques in the Asian region.

3. Status report: The co-ordinated research programme was approved by the Agency as an Agency programme in April 1982. Then, at the RCA annual meeting held on 23 September 1982, it was discussed and reviewed and decided that the above programme should be carried out within the RCA project. Accordingly, an agreement between the IAEA and the governments of the RCA member countries is now being sought. Subsequently, the research contractors and agreement holders who already have contracts with the Agency would participate in the RCA programme. Already 4 research contractors and 2 agreement holders are participating in this programme.

   The first Research Co-ordinated Meeting is planned to be held in Kyoto, Japan in November 1983, in which the paper work of each participant will be reviewed and possible co-ordination research between them will be discussed.
   The estimated budget foreseen is US$ 15,000.

Research contracts and agreements already concluded:

RCA/RA No.	Chief Investigator & Project Title	Allocated Fund (US$)	Date Implemented
3194/RB	M.A. Siddiqui Liaquat Medical College & Hospital Atomic Energy Medical Centre Jamshoro, Pakistan "Microwave induced hyperthermia as a sensitizer of radiotherapy in head and neck tumour"	5,000	1982-08-01
3196/RB	S. Puribhat National Cancer Institute Bangkok, Thailand "Study on modification of chemical and chemotherapeutic drugs on radiation sensitivity of cancer, in vitro and in vivo	5,000	1982-08-01

3265/CF	T. Sugahara Kyoto National Hospital Kyoto, Japan "Experimental and clinical studies on hyperthermia and chemical sensitizers in radio- and chemotherapy of cancer"	-	
3314/CF	Y. Onoyama Osaka City University Medical School Osaka City, Japan "Studies on the combined use of hypoxic cell sensitizers and hyperthermia with radiation in human cancer therapy"	-	1982-10-15
3351/RB	S. Krishnamurthi Cancer Institute Madras, India "A controlled clinical trial to evaluate a combination of radiation (R.T.) Bleomycin (BLM) 5-Flourouracil (5-Fu) and Vincristine (VcR) against a combination of R.T. and BLM only rationalized on cell kinetics in squamous cell carcinomas of the buccal mucosa"	5,000	1982-12-01
3430/RB	B.B. Singh Bhabha Atomic Research Centre Trombay, Bombay, India "Radiosensitization of hypoxic bacterial cells and animal tumours by membrane active drugs and hyperthermia"	3,000	1983-04-01

4. Workplan for 1984: (i) Research for Co-ordinated Programme on "Improvement of Cancer Therapy in Asian Countries by the Combination Treatment of Conventional Radiation and Physical or Chemical Means" will continue.

Budget foreseen for 1984 - US$ 50,000

Research contracts - 5,000 x 7 = 35,000

RCM 15,000

(ii) A training workshop on brachytherapy of the uterus cancer using manual and remote afterloading techniques is being considered to be held in Pakistan in 1984. The estimated cost is US$ 80,000.

Appendix 8

STATUS REPORT OF THE UNDP/RCA INDUSTRIAL PROJECT
1982/83

Status Report

UNDP Regional (RCA) Industrial Project

for

5th RCA Working Group Meeting

Dacca, Bangladesh

11 - 16 May 1983

I. Project Management

A. IAEA/UNDP are now completing actions leading to the appointment of a new Project Director to become effective 1 July 1983.

B. The permanent Project Office will be officialy opened 1 July 1983 at the Centre for Application of Isotopes and Radiation, BATAN, Jakarta, Indonesia. The UNDP Tokyo Office will be closed 30 June 1983.

C. Project Senior Board of Advisors was appointed 9 September 1982. The Board is composed of five members selected from industries and national institutions in the Region and appointed by the IAEA. The Board has oversight responsibilities for the Project, including annual review and evaluation of Project direction, progress and financial requirements. As such it has a high-level management function with responsibilities for recommending to both the IAEA and the UNDP changes in Project direction, priorities as well as financial management and resources requirements. Accordingly, the Board assumes a major role in overall Project management and direction. This function recognizes the specific responsibilities of the Project Director for co-ordinating and managing day-to-day operations of the Project and its activities. The Project Director serves as the IAEA/UNDP Representative to the Board and its Secretary. The membership of the Board is as follows.

Professor A.J. Lynch
Director,
Julius Kruttschnitt Mineral Research Centre
University of Queensland
Brisbane, Australia

Dr. G. Mukherjee
Vice Chairman
Steel Authority of India
New Delhi, India

Dr. Tsutomu Mochizuki
Member of the Board of Directors
Japan Atomic Energy Research Institute
Tokyo, Japan

Dr. Ani bin Arope
Director
Rubber Research Institute of Malaysia
Kuala Lumpur, Malaysia

Mr. Chamnan Suntornwat
General Manager
The Siam Kraft Paper Co.
Bangkok, Thailand

D. The second meeting of the Senior Board of Advisors will be held 2 - 3 June 1983 at the Siam Kraft Paper Company, Ban Pong, Thailand. The provisional agenda is attached as Appendix 1.

E. A preparatory meeting of selected National Project Counterparts was held 3 - 4 February 1983. The agenda and the list of attendees to the meeting are attached as Appendix 2.

II. Project Work Plan and Budget for 1983

A. The Project Work Plan and Budget for 1983 are attached as Appendix 3 and 4.

The 1983 UNDP Project budget is estimated to US$942,199. This budget exceeds by US$100,646 UNDP's currently approved level for the Project during the present budget year. It is agreed with UNDP New York that a special request can be made in June 1983 to consider the "shortfall" of US$100,646. If approval is given by UNDP funds may not be available to the Project until the 4th quarter of 1983. Adjustments in the 1983 Project Work Plan will be required if the additional funds are not allowed.

III. Sub-Project Activities

A. Sub-Project 1. Tracer Technology in Industry

A special two men Technical Mission was appointed in October 1982 to make a critical review of technological opportunities in the Region, with recommendations to be used for finalizing the Sub-Project Plan. The report of the Mission is attached as Appendix 5. The tentative Sub-Project Plan provides that the first training-demonstration will take place March 1984 at the Bhabha Atomic Energy Centre, Trombay, India and at the Singapore Institute of Standards and Industrial Research, Singapore. The final Sub-Project Plan with the training-demonstration Prospectus, will be completed by 30 June 1983 including all negotiations with participating industrial companies which will co-operate in the demonstrations.

B. Sub-Project 2. Non-Destructive Testing (NDT)

The 6th Meeting of NDT Expert Working Group was held 14 - 16 March 1983 Sydney, Australia to finalize a Regional plan for NDT Contification according to International Standards (see Appendix 6). The Plan is to be presented to the annual meeting of Governments party to RCA, September 1983 Vienna, Austria at the time of the IAEA General Conference. Participating Governments will be requested to review the Plan at that time and give its approval by 31 March 1984.

C. Sub-Project 3. Radiation Processing

1. Radiation Vulcanization of Natural Rubber Latex.

Construction of the 1,000 ton per year Pilot Plant is scheduled for commissioning June 1983 with country participation in technology transfer activities to begin October 1983 (See Appendix 7 "Sub-Project Work Plan")

A short term test-evaluation programme to confirm the reproducibility of data from the on-going technology development efforts at the Centre for Application of Isotopes and Radiation (CAIR) and at Takasaki Radiation Chemistry Research Establishment (TRCRE) has been initiated (see Appendix 8 Test-Evaluation Protocol and Schedule). This test-evaluation effort results from the recommendation made by Dr. Ani bin Arope, Director, Rubber Research Institute of Malaysia (RRIM) and Member of the Project Senior Board of Advisors.

The standard protocol provides that RRIM will be responsible for the pre- and post-irradiation procedures with CAIR and TRCRE providing the irradiation of the latex. The Rubber Research Institute of Sri Lanka (RRISL) and CAIR will provide collaborative test-evaluation data and information. A technical evaluation will be made and a report given to the Second Meeting of the Senior Board of Advisors, Ban Pong, Thailand 2 - 3 June 1983.

2. Radiation Curing of Surface Coatings for Wood Products.
With the completion of all negotiation and the issuance of a purchase order contract for a 300 keV, 50 mAmp Electron Beam Machine a final work plan for the Sub-Project on Radiation Curing of Surface Coatings for Wood Products has been established (see Appendix 9). The Plan provides for manufacture, shipping, installation and commissioning by April 1984. The first demonstration activities will start July 1984.

3. Radiation Cross Linking Insulating Material for Electric Wire and Cable.
This Sub-Project activity is awaiting Governmental decisions between Indonesia and Japan on a bi-lateral agreement whereby Japan is to provide a 1.5 to 2 MeV Electron Beam Machine. It is not expected that this Sub-Project can be initiated before 1984 - 1985.

4. Radiation Sterilization of Medical Products.
This first training-demonstration is scheduled for 26 September - 7 October 1983 in co-operation with the Bhabha Atomic Research Centre, Trombay, India and the Korean Advanced Energy Research Institute, Seoul, Republic of Korea. The Prospectus for the training-demonstration and a copy of IAEA's formal letter inviting participating Governments to nominate candidate to the training-demonstration is attached as Appendix 10.

D. Sub-Project 4. Nucleonic Control System

1. Paper Industry.
The Second training-demonstration on the use of nucleonic control systems for paper manufacture was held 28 March - 9 April 1983 at the Siam Kraft Paper Company, Bon Pong, Thailand and 11 - 16 April 1983 at the Japan Atomic Industrial Forum, Tokyo, Japan. The Prospectus and a list of attendees to the Second Training-Demonstration are attached as Appendix 11.

2. Steel Industry.

A caesium137 nucleonic control system, manufactured by the Toshiba Corporation, Tokyo, Japan was installed at the Bokaro Steel Plant, Bokaro Steel City, India May 1983. The first training-demonstration is scheduled begin October 1983 at the Bokaro Steel Plant and the Japan Atomic Industrial Forum. The Prospectus and IAEA's formal letter of invitation to Governments to nominate candidates to participate will be provided at a later date.

3. Minerals Exploration, Mining and Processing.

The first training-demonstration on nucleonic control system use in the minerals industry is scheduled for 28 August - 17 December 1983 and 8 January - 31 March 1984. The Prospectus and IAEA letter of invitation to Governments to nominate candidates for participation in the training-demonstrations is attached as Appendix 12.

E. Nuclear Instruments Maintenance

Three training workshops have been completed under the Project with 50 persons from 10 countries attending.

The first on-the-job training in nuclear instrument maintenance is scheduled to begin November 1983 Tokyo, Japan. The on-the-job training will be of four months duration and will be provided in co-operation with Japanese instruments manufacturers. The purpose of the training, to be given in the factories at the instruments manufacturers, is to provide increased capability and experience in design, technical operating factors for industrial system, maintenance strategies and case studies of actual experience in the use of nucleonic system in industrial plants. Participants accepted for the on-the-job training will be those already experienced in nuclear instruments maintenance with the objective of their assuming training leadership roles in their home countries.

12 January 1981

WORK PLAN

UNDP REGIONAL (RCA) INDUSTRIAL PROJECT

1981

JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
1. (2) Fellowships - Radiation Processing, Takasaki, 1 January - 30 June 2. Accelerated Test-Evaluat. of Vulcanized Rubber Product 15 January - 1 June 3. IAEA/UNDP Briefing new Project Director Vienna and New York (15 days)	4. Resident Expert - Radiation Processing Jakarta, 1 February - 31 December 5. Experts - Radiation Vulcanization Pilot Plant Installation, Jakarta 20 February - 31 March 6. Experts - Project Review Meeting, Tokyo 3-4 February 7. Experts - Accelerated Test Programme, Radiation Vulcanization of Rubber Latex, Takasaki 1-2 February	8. Special Advanced NDT Technology Advisory Group Meeting, Singapore 10-11 March 9. 6th NDT Working Group Meeting, Sydney, 14-16 March 10. 2nd Training-Demonstr. Nucleonic Control Systems for Paper Manufacture, Ban Pong, 20 March to 9 April; Tokyo 10-16 April 11. On-the-Job-Training Radiation Processing, Rubber Vulcanization Jakarta, 20 March - 19 August	12. Expert - Radiation Engineering and Dosimetry, Jakarta 15 April - 15 May 13. Expert - Radiation Engineering Rubber Pilot Plant, Jakarta, 30 April - 10 June 14. 2nd Radiation Proc. Technical Review Mtg. Jakarta, 20-21 April 15. Commissioning Rubber Vulcanization Pilot Plant, Jakarta 22 April 16. Commissioning Nucleonic Control System for Steel Manufacture, Bokaro City	17. Briefing new Project Director Tokyo (14 days) 18. Start Operation of Rubber Vulcanization Pilot Plant, Jakarta, 5 May	19. 2nd Senior Board of Advisors' Meeting Bangkok, 2-3 June 20. Final Briefing Vienna (5 days) and New York (2 days) 21. Evaluation and Testing of Vulcanized Rubber Products, 1 June - 31 December
FD/CTA Travel		FD/CTA Travel	FD/CTA Travel	FD/CTA Travel	FD/CTA Travel
1. Requirement - Issuance of (2) Type II Fellowships - 12m/m Cost: US$ 9,000 2. Requirement - Agreement Accelerated Test-Evaluation Plan 10 January 3. Requirement - Issuance of (1) Special Service Agreement Cost: US$4,600	4. Requirement - Issuance of (1) Special Service Agreement "in kind" and/or "in cash" contrib. Government of Japan 11 m/m estimated at US$45,000 5. Requirement - Issuance of (2) Special Service Agreements Cost: US$10,850 (Japan Contr.to UNDP Project) 6. Requirement - Issuance of (2) Special Service Agreements Cost: US$3,610 7. Requirement - Issuance of (2) Special Service Agreements Cost: US$1,756	8. Requirement - Issuance of (6) Special Service Agreements Cost: US$15,800 (Japan Contr.to UNDP Project) 9. Requirement - Issuance of (5) Special Service Agreements Cost: US$10,450 (Japan Contr. to UNDP Project) 10. Requirement - Issuance of (11) Special Service Agreements Cost: $33,000 (RAS/8/004) $11,650 (Japan Contr. to UNDP Project) 11. Requirement - Issuance of (7) Training Agreements Cost: US$24,720	12. Requirement - Issuance of (1) Special Service Agreement Cost: US$3,800 (Japan Contr. to UNDP Project) 13. Requirement - Issuance of (1) Special Service Agreement Cost: US$4,620 (Japan Contr. to UNDP Project) 14. Requirement - Issuance of (12) Special Service Agreements Cost: US$15,400(Japan Contr. to UNDP Project) 15. Requirement - Issuance of (1) Special Service Agreement Cost: US$2,200 (Japan Contr. to UNDP Project) 16. Requirement - Issuance of (1) Special Service Agreement Cost: US$2,400	17. Requirement - Issuance of (1) Special Service Agreement Cost: US$2,500 18. Requirement - Operational availability of Pilot Plant, 1 May	19. Requirement - Issuance of (5) Special Service Agreements Cost: US$7,700 20. Requirement - Final Briefing IAEA/UNDP by Proj.Dir.with termination 20 June Cost: US$4,000 21. Requirement - Develop and Approve Protocol for Test-Evaluation Programme

WORK PLAN

UNDP REGIONAL (RCA) INDUSTRIAL PROJECTS

1 9 8 1

JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
22. Please in Operation New Project Office with New Project Director, Jakarta 1 July 23. (2) Fellowships - Radiation Processing, Takasaki, 1 July - 31 December		24. First Japan MOT Training Course (RT) and (UT), Tokyo, 12 September - 8 October 25. First Training-Seminar, Radiation Sterilization of Medical Products, Jamanv, 26 September - 7 October; Seoul 12-14 October	26. First Training-Demonstration Nucleonic Control Systems for Sheet Manufacture, Jakarta (2 weeks) and Tokyo (1 week)	27. First Training-Seminar Nucl. Control Systems for Minerals Beneficiation Sydney and Manila, 1 Nov.1981-31 Jan.1982 28. On-the-Job-Training Maintenance Nucleonic Control Systems, Tokyo 1 November - 20 December 29. Excess-Surface Coating Pilot Plant, Test Runs and Commissg., Jakarta November (5 weeks) 30. Commissioning Surface Coating Pilot Plant, Jakarta, November 31. On-the-Job-Training Radiation Processing Wood Surface Coating Jakarta, 15 Nov.-31 Dec. 32. Start Operation of Surface Coating Pilot Plant, Jakarta, 20 Nov. to 31 December 33. 2nd Industrial Techn. Transfer Workshop, Jakarta, 21-23 November 34. 1st Senior Board of Advisors' Meeting, Jakarta, 26-29 November	
		PO/CTA Travel	PO/CTA Travel	PO/CTA Travel	
22. Requirement - Issuance of (1) Special Service Agreement for Project Director 23. Requirement - Issuance of (2) Type II Fellowships 12m/m Cost: US$9,000 (Japan Contr. to UNDP Project)		24. Requirement - Issuance of (10) Special Service Agreements Cost: $35,000 (RAS/8/008) $8,000 (Japan Contr. to UNDP Project) 25. Requirement - Issuance of (10) Special Service Agreements Cost: US$33,500	26. Requirement - Issuance of (10) Special Service Agreements Cost: $35,000 (RAS/8/008) $11,550 (Japan Contr. to UNDP Project)	27. Requirement - Issuance of (10) Special Service Agreements Cost: $79,200 (Austr. Contr. to UNDP Project) 28. Requirement - Issuance of (5) Special Service Agreements Cost: $26,000 (RAS/8/008) $11,500 (Japan Contr. to UNDP Project) 29. Requirement - Issuance of (2) Special Service Agreements Cost: $7,700 (Japan Contr. to UNDP Project) 30. Requirement - Issuance of (1) Special Service Agreement Cost: $2,200 (Japan Contr. to UNDP Proj.) 31. Requirement - Issuance of (7) On-the-Job-Tr. Agreements Cost: US$14,350 32. Requirement - Operational availability of the Pilot Plant by 10 Nov. 33. Requirement - Issuance of (12) Special Service Agreements Cost: US$17,100 34. Requirement - Issuance of (5) Special Service Agreements Cost: US$8,200	

Discussion Meeting

UNDP Regional (RCA) Industrial Project

3 - 4 February 1983

Office of the Project Director

Tokyo, Japan

V. K. Iya
Director, Isotope Group
Bhabha Atomic Research Centre
India

M. Ridwan
Deputy Director General
National Atomic Energy Agency
Indonesia

Ong Chor Eong
Director
Technical Engineering & Scientific Services Div.
Singapore Institute of Standards and Industrial Research
Singapore

S. P. Kasemsanta
former Secretary General
Office of Atomic Energy for Peace
Thailand

E. E. Fowler
Project Director and Chief Technical Advisor
UNDP/IAEA Regional Industrial Project
Tokyo

S. Machi
RCA Co-ordinator
Department of Research and Isotopes
International Atomic Energy Agency
Vienna

Discussion Meeting

UNDP Regional (RCA) Industrial Project

3 - 4 February 1983

Office of the Project Director

Tokyo, Japan

Thursday, 3 February 1983

I.	Welcoming Remarks	Mr. E. E. Fowler Meeting Chairman and UNDP Project Director	10:00 - 10:05
II.	Statement of Purpose of the Meeting	ditto	10:05 - 10:15
III.	Topics for Discussion		
	1. UNDP Project Plan (1 April 1982)		10:15 - 11:00
	Recess		11:00 - 11:15
	2. Acceptance Criteria of Project Special Training-Demonstration Activities		11:15 - 12:30
	Lunch		12:30 - 14:30
	3. Industrial Participation		14:30 - 15:30
	Recess		15:30 - 15:45
	4. Qualification of Project National Counterparts		15:45 - 16:30
	Adjournment		16:30

Friday, 4 February 1983

IV.	Second Industrial Technology Transfer Workshop	10:00 - 10:30
V.	Preparation of Background Information for Second Project Senior Board of Advisors Meeting, 2 - 3 June 1983, Thailand	10:30 - 12:00
	Adjournment	12:00

Preliminary Acenda

Second Meeting

Senior Board of Advisors

2 - 3 June 1983

Ban Pong , Thailand

Thursday 2 June 1983

I. Welcome

II. Introductory Remarks

III. Announcements

IV. Adoption of Agenda

- Recess -

V. Project Status Report

A. Sub-Project Activities

B. Budget

- Discussion -

VI. Report on Accelerated Test Programme for Radiation Vulcanization of Natural Rubber Latex

- Discussion -

- Lunch -

VII UNDP Project Special Training-Demonstration Activities

A. Criteria for Acceptance of Participants

B. Applied vs. Basic Training

eg. Radiation Processing

- Discussion -

- Adjournment -

Friday 3 June 1983

VIII. Visit Siam Kraft Paper Company

A. Briefing on Nucleonic Control System Use for Paper Manufacture

B. Briefing on 5 Year Demonstration Programme

- Discussion -

- Lunch -

IX. Other Business

X. Acceptance of Board Report

- Adjournment -

Project Budget
1983

		(in US Dollars)
I.	UNDP	
	A. Experts and consultants	33,526
	B. Training	204,420
	C. Equipment	573,305
	D. Administration	56,000
	E. Miscellaneous	5,000
	Total	872,251
II.	PARTICIPATING GOVERNMENTS	1,887,417
	GRAND TOTAL	2,759,668

TRACER TECHNOLOGY

SCOPE OF MISSION

The Mission will be of three weeks duration divided between India and Singapore. The task of the Mission is to identify, analyze and negotiate specific industrial plan(s) participation including joint UNDP/company financiang. The identification and analysis should provide among other things:

a. Specific industrial plant(s) and location(s);
b. Specific industrial process(es) selected for tracer applications with justification for the selection(s) made;
c. Specific identification of interface requirements for integrating tracer technology and equipment into regular plant operation;
d. Special requirement for training of plant production personnel in tracer methodology;
e. Specific identification of required equipment and materials for plant demonstrations and special training;
f. Estimated budget for the Sub-Project including both special training at BARC and SISIR plus plant demonstration.

Mission Experts

Dr. Bernard A. Fries
91 Acacia Drive
Orinda, California 94563
USA

Dr. V.K. Iya
Director, Isotope Group
Bhabha Atomic Research Centre
Trombay, Bombay 400 085
India

REPORT OF THE

UNDP WORKING GROUP

ON

TRACER TECHNOLOGY

OF THE

Regional UNDP/RCA Project on Industrial

Applications of Isotope and Radiation Technology.

DR. BERNARD BRIPS AND DR. VASUDEVA K. IYA

November 15 - December 4, 1982

BOMBAY - SINGAPORE.

C O N T E N T S.

SUMMARY :

The Expert Working Group surveyed the opportunities for the transfer of technology under the sub-project for Radio Tracer Technology of the UNDP Project and concluded that this programme should be undertaken at the earliest time possible, preferably as soon as fall 1983. Incorporation of training at both India and Singapore was strongly recommended. Details of the training course and workshop demonstrations were outlined. An overall budget of about $ 250,000 was established for the five year period of the programme.

I. Introduction: The initial steps needed for accelerating and expanding isotopes applications and radiation techniques in Regional industries through a Regional UNDP industrial project were discussed and outlined at an IAEA Advisory Group Meeting on Industrial Applications, attended by experts and participants from the Region, held in Bombay in December 1976. Subsequently, a 4-man Technical Mission of experts visited each of the 10 developing RCA countries and described, (IAEA Technical Mission Survey Report, 15th December 1978) the current status of industrial isotopes and radiation applications in each of the countries visited, and identified the main in-puts necessary for introducing these technologies into their industries. Based on the Mission's Report, and on other technical reports and consultants' meetings reports, a sub-project on Tracer Technology was designed and included as part of the overall Regional UNDP Project on Industrial applications of Isotopes and Radiation Technology.

The Project Plan(Document of UNDP-IAEA, 1st April 1982, RAS/79/061/F/01/10) for this project defines the scope, budget, outputs and schedules for this sub-project.

In view of the facilities and expertise available in India, BARC would "serve as a focal point and as a centre of excellence" to support technology transfer in this sub-project, and would provides technical expertise and overall management for in-plant demonstrations of nucleonic process control technology in plants and factories selected for this purpose in India and in Singapore. Further, the Project Plan specifies three special Training courses each of 2 week durntion (page 27, paragraph 3, but compare page 36, paragraph 3) would be coupled with three one-week 'In-plant' demonstrations to be carried out in industrial production facilities for fertilizers and petroleum refineries. The goals of the present expert working group was set forth in the letter of 29 July 1982 from Mr. E.F. Fowler to Dr. V.K. Iya. The task of the Mission would be "to identify, analyse, and negotiate specific industrial Plants' participation". The identification and analysis were to provide, among other things, " Specific industrial plants and processes selected for tracer applications, identification of interface requirement for integrating tracer Technology & equipment into regular plant operation, identification of equipment & material, and an estimated budget".

In addition to the above outlined by Mr. Fowler, the Working Group has tried to determine the need for such training and the interest of industry for such applications, in India & Singapore, and the scope of any training course to be conducted.

The Working Group conducted its Mission by contacting appropriate industries in both India and Singapore, some having been previously visited. Informal discussions were held with principal management and engineering personnel. The discussions were usually centered on presentations by the Working Group which described already successful tracer applications in similar industries. In some case more formal seminars were held in

whereby representatives of several industries were present. At the end of these discussions responses were evoked from the participants to determine the extent of their interest. In many cases, actual on-going plant problems were described and possible radiotracer solution to these problems were offered.

The following is a more detailed account of the Mission and its recommendations.

II. Details of Mission:

A. Procedure : The Working Group met in Bombay and commenced its mission in India on the 15th November with a visit to BARC facilities, including the 40 MW Reasearch Reactor CIRUS used for Isotope production, and the Isotope production and industrial applications laboratories. Visits to a number of industries and institutions had been previously arranged by the BARC staff. Some BARC staff, involved in industrial applications, accompanied the Experts during all the visits in India. A brief seminar was generally held at each industry or institution during which the scope of radiotracer applications was explained to senior management and technical staff. Detailed discussions followed on problems relevant to the particular industry and to possible solutions through the use of radiotracer techniques. During visits to individual plants, the feasibility of using their facilities for tracer demonstration was also discussed.

The Group proceeded to Singapore on 23rd November and commenced its work with discussions at SISIR followed by visits and discussions to other institutions. A seminar was organised by Mr. Ong Chor Eong at SISIR representatives from industries and the university were invited. All aspects of tracer applications were discussed including safety and waste disposal. The seminar was

well attended (see annexure 1) and the questions that followed indicated the keen interest of industry to use tracers to solve problems that may arise.

B. Visits : A list of industries and institutions visited in India & Singapore, along with the main persons with whom discussions were held is enclosed in the annexure. Details of a few plant visits follow :-

1. Larsen & Toubro, Powai, Bombay : This is one of the leading engineering companies in India, engaged in the design, manufacture & supply of major components or even entire plants for the dairy, cement, nuclear & chemical industries. The R & D Department has facilities to enable process parameter studies on pilot-plant scale for different process operations. Radiotracer studies have been periodically carried out to establish in their pilot plant facilities, the designs for plants manufactured by the company. According to their General Manager, these radiotracer investigations were specially useful for their spray driers, vibro fluid bed driers and ball mill operations. They could also be of interest for their distillation column manufacture.

2. National Rayons Corporation :- This company has a large factory, about 35 kms from Bombay, employing about 7000 workers for the production of rayon yarn for textiles and nylon yarn and fabric for automotive tyres. The nylon plant carries out all the stages of production of yarn and fabric used as tyre cord for the tyre industry. The plant is modern with a centralised process control system. The rayon plant uses rayon grade pulp board as the basic raw material. An ancillary plant produces the required caustic soda using the electrolytic process. This is a relatively old rayon plant.

Following discussions with the staff, the usefulness of tracers for studying various plant parameters such as flow rates at different locations, leakages in heat exchangers, residence time studies, etc. were pointed out. The technical staff of the plant were enthusiastic about such studies and the management is very progressive. BARC has agreed to follow up this interest.

3. University Dept. of Chemical Technology, University of Bombay :-

We visited the facilities for carrying out educational-type demonstrations in the chemical engineering department and held discussions with Prof. M.M. Sharma, Head of the Department. Prof. Sharma explained that demonstration experiments are included as part of under graduate curriculam and radiotracers are used in some of these demonstrations. The possibilities of demonstrating experiments on mixing of solids, solid-liquid, and liquid-liquid phases, as well as flow of liquid (pump capacity), gases, solids, etc., were discussed. Studies could also be conducted to demonstrate the extent of back mixing in 2-phase contactors, the effectiveness of different designs of stenders, different types of column packing materials, indication of dead zonein process vessels, residence time distribution of viscous fluids in reactors, etc. Prof. Sharma promised full cooperation in the execution of this sub-project, and all assistance to BARC staff for carrying out a training programme. Participation of his department both in lectures & demonstration experiments would be useful.

4. Gujarat State Fertilizer Corporation :

India has a strong infra-structure in the chemical & petrochemical field in Baroda. These plants are large & modern. The GSFC organised a seminar for the working group to which many other industries were invited. These included Indian Petrochemicals Ltd., Gujarat Polymers, Heavy Water Plant, Baroda, etc. The seminar was attended by about 50 senior management and technical people. Considerable interest in tracer technology was raised.

We had seperate discussions with the management & senior technical staff of GSFC and IPCL. The management of these plants is progressive and the technical staff showed considerable interest in the use of radiotracers for solving specific plant problems. They have indicated considerable interest for ootainting training in this technology.

5. National Organic Chemicals Industries Ltd.

This is a petrochemical complex near Bombay with problems similar to those encountered in Baroda. A seminarwith their management & technical staff led to profitable discussions for potential applications in their plant.

6. Automobile Research Association, India Pune :-

This research establishment is currently engaged in wear studies employing radioactive piston rings irradiated at BARC. The Laboratory carries out these research studies for the entire automotive industry in India. They are interested in expanding their research work to include chromium-plated piston rings, cylinder liners, and other engine parts.

The ARAI arranged a visit to Kirloskar Engineers Ltd., where additional discussions were held on wear studies. KEL seemed reluctant to use short-term radioactive wear studies for the complete evaluation of their engines but the advantages of such short-term studies for rapid screening purposes was agreed to.

7. Singapore Institute for Standards and Industrial Research :-

Discussions were held with Mr. Ong Chor Eong, Director, Industrial Services Division & Mr. Wang Kang Wah, Head, NDT and Applied Physics section regarding the background & current status of tracer applications in Singapore. It became evident that

SISIR has done considerable work in the past using tracers for trouble shooting operations in Industry. However, for the last few years, SISIR's priorities do not seem to include promotion of tracer technology with industry. Some industries however use tracers on their own and a large experiment was recently conducted by the Port of Singapore Authority using radiotracers for port development work, especially for sediment transport. A seminar organised by SISIR was attended by more than 30 participants, (see annexure 2) and a number of questions were raised on the specific problems in industry. In particular officials of the Ministry of Environment, Dept. of Sewarage, who have already carried out radiotracer transport time studies in sewer-pipes appeared anxious to use tracers to establish certain process parameter in their sewage treatment plants, and expressed the hope that UNDP/IAEA could support them in this activity. The working group suggests that this may be worked out as part of the RCA sub project in tracers.

8. Singapore Refining Company:- This company has multiple ownership and the Caltex company portion was visited. A seminar held at the Caltex office was attended by members of the Caltex Staff, British Petroleum, & Singapore Petroleum Company, also co-owners. Many tracer applications aimed at solving refinery problems were discussed. The Managing Director, Caltex Asia, offered to assist in the execution of this sub-project, or specifically, by offering refinery facilities for a tracer demonstration.

9. National University of Singapore :- The Department of Physics which is already using a gamma irradiation facility can provide technical assistance to radiotracer applications in Singapore.

III. Mission Recommendations :

The Working Group received positive response and interest to the introduction of this technology at all industrial visits. In no instance was a negative attitude encountered. At a few visits a somewhat hesitant initial attitude was turned into an enthusiastic response. Indeed, management personnel were asking their engineering personnel why such methods were not already being used at their plants.

In Singapore considerable radiotracer work has been undertaken in the past (particularly by the Port of Singapore Authority, major petroleum refining companies, electronic industries, & several others with the aid of SISIR but this has fallen off considerably. Mr. Ong Chor Kong indicated that if a new demand arises, SISIR would offer any necessary cooperation.

In view of the above, the Working Group endorses the concept of the UNDP programme with the establishment of its training programme at BARC and with supplemental training at SISIR to strengthen the value of the training program itself and to provide a stronger base for participation by Singapore.

The Working Group strongly recommends starting the programme at the earliest possible date to take advantage of the enthusiasm generated at this time. A prolonged delay before the training program is inaugurated and before beneficial results can be obtained will dampen such enthusiasm and will require additional efforts to rekindle interest. Accordingly, the working group urges a starting date in 1983 rather than the 1984 date incorporated in the Work Plan document.

The Working Group recommends that BARC & UNDP should ensure close coordination and follow-up of these courses with the assignment of experts to the participating countries so that effective transfer of technology is achieved. Budget provision for this component should be initiated in 1983, and a substantial component included for 1984. The working group also agrees that BARC should provide the technical expertise required and the overall management of this sub-project.

IV. Training Programme :

The training course and demonstration workshop are designed to include the following :-

i) A 3-week combination course in India consisting of lectures, laboratory experiments and demonstration workshops.

ii) A later one-week demonstration-workshop in Singapore, couples with industrial visits.

A. Training Course : The working group proposes a course consisting of laboratory practice, lectures and in-plant demonstration during this 3-week period in India, after which, the participants would go to Singapore for a week for additional plant demonstrations.

Since some uncertainity prevails as to the organisation of this final week, we recommend a deadline of April 1, 1983 by which time it must be determined whether this part of the course can be implemented.

The three week course in India has been framed to be complete & comprehensive & should enable the participants to initiate tracer work in their own plants. The details of their course are covered in Annexure-3. Annexure 4 identifies the industrial plants and the processes recommended for demonstration workshops.

Admissions : The Working Group recommends 8 to 12 participants for each course. Participants in the course must have either a basic degree in physics or chemistry, with atleast 2 years' industrial plant experience or a degree in chemical engineering with one year's plant experience. As far as possible, participants should be presently working in industry, so that upon completion of the course they are able to use the knowledge gained and initiate action for the benefit of their industries. Wherever possible, candidates for participation, who outline possible applications for their industry, will receive preference for admission to the course. This will not limit those instances where participants from national research centres would introduce tracer technology into their industries.

Examination : The working group recommends a small examination at the end of the 3-week period in India and a certificate would be issued on behalf of the UNDP to those participants who successfully complete the course.

Administration : A Course Director should be appointed for each course by the National counterpart of India, at least 6 months before the scheduled date of commencement of the Training course.

Schedule : The Working Group recommends strongly that the first training course be initiated in the latter part of 1983, say September or October, to exploit the interest displayed by industry in both India & Singapore during this Mission. Subsequent courses should be held at yearly intervals. The equipment may be distributed among the participant countries at the end of the Project.

Details of the additional equipment, which must be procured by UNDP are listed in Annexure 5. Sufficient equipment is recommended so that small groups of trainees can conduct individual measurements during a given demonstration. These individual results can then be compared among the groups.

VI Budget : An estimate of UNDP inputs at current prices is given below :-

UNDP in-puts :	Amount in US $
1) 10 participants for 4 weeks /per course. Fellowships for 10m/m per course. i.e. for 30m/m for 3 courses @ 1000$/mm. i.e.	30,000
2) International travel : 30 persons @ 1500$ average per person	45,000
3) Experts : 6m/m.	72,000
4) Special nucleonic field & laboratory equipment and teaching aids.	90,000
5) Miscellaneous travel for coordination between Indian & Singapore counterparts.	2,000
6) Contingencies to meet urgent repairs, fabrication jobs, minor incidentals, during demonstration workshops, cost of radioisotope and freight charges for Singapore demonstration workshops, internal travel etc., for 5 year period.	8,000
	$ 247,000

LIST OF INSTITUTIONS AND PERSONS VISITED

Bhabha Atomic Research Centre :	Mr.A.C.Kapen, Head, Hydrology & Tracers Section, Isotope Group, BARC. Mr. R.R.Wamorkar, Head, Radiography Section, Isotope Group, BARC. Mr. R.G.Deshpande, Head, Isotopes Division, BARC Mr. Ajmera, NAA Section, Isotope Group, BARC. Mr. K.Krishnamurthy, Head, Radiation Technology Section, Isotope Group, BARC
1. Larsen & Toubro, Somaiy :	Mr. K.P.Banerjee, General Manager (R&D) Dr. A. Bhattacharya, Manager, Process Technology, L & T Works. Dr. Mishra, Senior Manager, R&D.
2. National Rayons Corporation, Kalyan. :	Mr. D.M.Trivedi, Chief Executive, NRC. Mr. K.A.Amudhan, Production Manager, Nylon Plant. Mr. D.S.Nadkarni, Production Manager, Rayon Plant. Mr. Mulli, General Manager.
3. University Department of Chemical Technology, University of Bombay. :	Prof. M.M.Sharma, Prof. of Chemical Engineering & Chairman, Scientific Advisory Committee to the Petroleum Ministry, Govt. of India.

4. Gujarat State Fertilizer Corporation, Baroda.	:	Mr. Moosa Raza, Managing Director. Mr. Shridhar, Special Director. Mr. M.J.Dholakia, Plant Supdt.
5. National Organic Chemicals India Ltd., Thana-Belapur Road.	:	Mr. K. Kumar, Field Engineer, Maintenance & Special Services. Mr. P.H.J.Merckx, Manager, Maintenance Engineering. Mr. Shukla.
6. Automobile Research Association, POONA.	:	Mr. Shastry, Asstt. Director.
7. SISIR	:	Mr.Ong Chor Eong, Director, Industrial Services Division, SISIR. Mr.Eang Keng Wah, Head, Non destructive Testing & Applied Physics Section, SISIR.
Dept. of Radiological Protection, Ministry of Health	:	Mr. Clive Stankey
Ministry of Environment, Dept. of Sewerage	:	Mr. Donald Goh Hock Swee.
8. Singapore Refining Co Pte.Ltd	:	Mr. Enrico Sismonde. Mr. B.K.Murphy, Managing Director, Caltex Asia. Mr. Jamar En, Refinery Technical Supdt. Mr. Roger Mc gary, Engineer.
9. National University of Singapore.	:	1) Prof. Laxmi Narayan, Visiting Professor, Dept. of Physics. 2) Prof. RajaRatnam, Prof. of Department of Physics. 3) Prof.Mrs. Lee, In-charge of gamma validation facility, Dept. of Physics. 4) Prof.Avindhan, Dept. of Botany.

SISIR, as the Singapore National Counterpart
for the
UNDP/IAEA (RCA) Regional Project
on Industrial Applications of Isotopes and
Radiation Technology, invite

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to

A Seminar on
Industrial Applications of Radioisotopic
Tracer Technology

Time: 0900 - 1300 hours
25 November 1982

Place: SISIR Meeting Room 3
5th Floor
SISIR Building
179 River Valley Road

Speakers: Mr Bernard A. Fries
Mr Heng Keng Wah, SISIR
Dr V.K. Iya, BARC, India
Mr Ong Chor Eong, SISIR
ONG THIAM SIN

(Since SISIR is just within the CBD, motorists driving in from outside the restricted zone may wish to know that they may park their car at the Tank Road/Clemenceau Avenue Car Park which is outside the CBD).

About the Speakers:

Mr Fries is with Chevron Corporation in USA and is a pioneer of the use of tracers in process plants. He is the author of many papers on the subject and a well-known authority on tracer application in industry.

Dr Iya is Director of Isotopes Division in Bhabha Atomic Energy Research Centre in Bombay and has extensive experience in radiotracer applications and other industrial applications of radiation technology.

M/s Ong Chor Eong (Director, Industrial Services, SISIR) and Heng Keng Wah (Head, Physical & Nondestructive Testing Section, SISIR) are members of a tracer applications group from SISIR and the National University of Singapore that successfully demonstrated the use of this technology to Singapore industry in 1970-75.

RSVP: Miss P K Tan
Tel. 3360933,
xtn. 160

Programme

0845-0900:	Registration and Opening
0900-0945:	Introduction to Tracer Technology - its applications, advantages and economic benefits
0945-1045:	Radiotracer techniques
	- design of tracer studies
	- isotopes selection and preparation (IYA)
	- injection
	- detection
	- safety and health
1045-1100:	Coffee Break
1100-1230:	Case histories
	(a) applications in process plants
IYA FRIES'	(b) applications in other industries and the environment
	(c) laboratory experiments
	(d) some applications in Singapore
1230-1300:	Discussions.

Seminar on
Industrial Applications of Radioisotopic Tracer Technology
held on 25 November 1982

Name	Organization	Designation
Foong Chee Leong	Sewerage Dept., Ministry of the Environment	Engineer
Yong Choh Shen	" - "	Lab. Tech.
Chee Sai Kit	" - "	Engineer
Lee Aik Beng	" - "	Engineer
Teo Kai Hong	" - "	Sr. Lab. Tech
Teh Hong Kee	" - "	Engineer
Chia Boon Hong	" - "	Engineer
Tay Kok Long (Miss)	" - "	Lab. Tech.
Woo Fong Wah (Miss)	" - "	Lab. Tech
Donald Goh	" - "	Sr. Engineer
Yeo Keng Woon	Shell Eastern Petroleum Ltd	Technologist
Woo Fo Keng	" - "	
Ho Kim San	" - "	
Wong Liang Yong	S'pore Refining Co Pte Ltd	Chem. Engineer
Tai Chwee Jan	" - "	Engineer
Teo Yow Choo	" - "	Engineer
R H Fleming	Mobil Oil (S) Pte Ltd	Supv.
L.S. Quek	" - "	L. Engineer
Tan W.I.	" - "	C. Engineer
David Lim	" - "	Engineer
Tan Chen Sian	British Petroleum	Services Engineer
Quek Khai Hor	Pasir Panjang Power Station, PUB	Engineer
Lau Gar Ning	Jurong Power Station	
Chew Soon Hoe	National University of Singapore	Senior Tutor
Prof. Avadhani	" - "	
A.S. Rajendra	Port of S'pore Authority	Chief Engineer
Pui Syn Kong	" - "	Ex. Engineer
Lee Tsun Wai	Radiation Protection Inspectorate	S. Inspector
Clive Starkey	" - "	
Sunti Kuagoolkijgarn	Thai Industrial Standards Institute, Bangkok, Thailand	
Lim Choon Siew	S'pore Institute of Stds. & Industrial Research (SISIR)	Head, Chemistry Se
Stanley Ling How Chiong	" - "	Chemist
Khoo Lee Meng	" - "	Head, Mech. & Structural Engg.

UNDP Course on Radiotracer Techniques in Industry

Duration	: 4 weeks	: 3 weeks India; 1 week Singapore.
Lectures	: 30	
Practicals	: 10	
Plant demonstrations	: 6	: 4 India; 2 Singapore.

Course Content :	No. of Lectures.
Introduction to industrial processes - Dispersion - Turbulance - recirculation - mixing - blending - residence time distributions - material transport - design aspects of chemical equipment - need for control	3
Tracer concepts : Theoretical introduction- mathematical modelling of tracer behaviour - dispersion model - series mixed tank model	2
Conventional Tracers & their application - chemical tracers - fluorescent tracers - particulate tracers - advantage & problems	1
Basic radiation physics - radioactivity - properties of radioisotopes - interaction of radiation with matter	2
Radiochemistry - isotope production - chemical processing of isotopes - tracer preparation	2
Radiation detection and monitoring - nuclear detectors - associated electronics - field equipment - radiation protection equipment	3
Radiation hazard control - Safety aspects in laboratory work in field application - allowable dose levels - max. permissible concentration - role in planning tracer operations	2

	No. of Lectures
Radiotracer methods in chemical industry Typical examples of application - choice of tracers - experimental planning - conditions of operations - interpretation of data.	3
Radiotracer methods in metal industry Typical examples of application - choise of tracers - field problems - data interpretation	2
Radiotracers in petroleum industry Exploration - production - refineries and transport of petroleum products - oil soluble tracers - special field requirements	1
Leak detection - Analysis of problem - choice of isotope method - leaks in industrial components - on-stream trouble-shooting - buried pipelines - liquid and gas tracers - field problems	2
Flow Measurements :- using radiotracers - closed conduits - peak to peak and dilution methods - open streams - range of applications	2
Tracers in environmental pollution - Dispersion of pollutants in large water bodies - activation analysis - activable tracers - gaseous tracers in plume studies	2
Use of computers - Mathematical analysis of tracer data - desk computer applications	1
Economics of tracer use - low investment - large benefits - manpower requirement - case studies	1
Setting up a Tracer Laboratory Types of laboratories - equipment - ventilation requirements - procedures of licensing - financial inputs	1
Laboratory Practicals: Radiation protection equipment - shoe bags - gloves - remote handling equipment such as tongs - vial openers & decappers - lead pots - masks.	

Alpha, beta and gamma monitors - their use - film badges - TLD's - pocket dosimeters.

Characteristics of GM+Nal Scintillation detectors - efficiencies, geometry of detection, resolution, dead time and counting statistics.

Characteristics of Germanium detector - gamma ray spectroscopy - analysis of spectra identification of energies and radionuclides.

Liquid scintilation counting - scintillators - sample preparation-standards - quench correction - chemiluminiscence.

Reactor irradiation of shortlived isotopes - target preparation - neutron irradiation - simple chemical processing - preparation of standards - transport of radioisotopes.

Activation analysis - use of reactor rapsit system - post irradiation cooling and chemistry and use of germanium detector to identify the nuclides produced.

Flow measurement using the peak to peak and the total count method in a laboratory pipeline.

Residence time distribution study in a laboratory model - effect of baffles on dead space and channeling - use of computer to interpret data.

Mixing experiment in laboratory model - single point monitoring and multi-sample analysis - interpretation of data.

Leak detection in a closed & pressurised vessel using krypton-85 and SF_6 gas and Helium leak detector - comparison of methods.

Demonstration Workshops:

The following list includes possible demonstrations and work places:

India :

1. Larsen and Toubro Ltd.,

(a) Residence time distribution (including backmixing) on Vibrofluidbed Drier using sand labelled with gold-198. The tests would be made under different experimental conditions such as vibration frequency, stroke, feed rate, air temperature, etc.,.

(b) Study of ball mill breakability characteristics for limestone feed for cement production. Ball mills are highly energy intensive, and optimisation here would be of great use in proper design of cement plants. Limestone irradiated in the reactor would give sodium-24, which would act as the tracer for the study.

(c) Interface Responsibilities:

L & T :- all physical facilities for demonstration-assistance of trained staff.

BARC :- provision of tracers, detection & monitoring equipment.
- provision of expert at supervisory level for tracer demonstration & of health physics coverage.

2. National Rayon Corporation :

(a) - Blending efficiency and residence time distribution in the rayon plant. The tracer (Na-24) may be introduced in one of the Xanthate dissolvers (capacity 5000 litres) and the degree of blending for several batches could be observed in the blender (capacity 12000 litres).

(b) - Residence Time studies at different stages (filter presses, ripeners, spin bath, etc) could be carried out.

(c) - Interface Responsibilities : as in 1-c above.

3. Standard Alkali, Thane :

(a) - mercury inventory in electrolytic cells, using Hg-197 tracer.

(b) - Interface responsibilities : as in 1-c above.

4. Still other possible plant demonstrations include :

Mocil, Thane : - Leak detection in an industrial unit (gas or oil leak).

BARC, Bombay : - Leak detection in a buried pipeline (Liquid or gas leak).

Hindustan Petroleum, Bombay :- : Flow measurement in pipeline or open channel.

Singapore :

1. Dept. of Sewerage, Ministry of Environment.
   (a) mixing efficiency & location of dead zone in a 2-million gallon tank. suggested tracer Br-82.

2. Singapore Refinery :-
   Flow rate of cooling water to a processheat exchanger.
   Suggested tracer :- Br-82.

3. Industrial visit to observe routine use of krypton-85 to detect leaking electronic component in the electronic industry. Possible locations are National Semiconductors, Fairchild, and Texas Instruments.

4. Special considerations :- the above will be possible provided UNDP makes an early proposal to decide who will then have to obtain the necessary approvals. Expert assistance and finance from UNDP for procurement of tracers & equipment will be necessary and has been included in the budget.

Interface Responsibilities :-

SISIR will be responsible for coordination of arrangements. Both SISIR & EMC will assume joint responsibility for the technical aspects of the tracer demonstrations. Assistance from local plant engineers from the industry will be obtained.

Equipment for Tracer Technology Courses and Demonstration Workshops:

1. Portable, battery operated, counting systems as follows :-

(a) Counting scalers for use with geiger and scintillation counters. 6 each : ca $ 6000

(b) Count rate meters for use with geiger and scinitillation counters multirange unto 10^5 cpm full scale 6 each : ca $ 5000

(c) Geiger - Muller tubes

i) Gamma-ray type (heavy wall) -

1-inch x 1½-in. 12 each : ca $ 1000

ii) Beta-ray type (30mg/cm^2 wall)

5/8-in x 7-in(for ^{85}Kr) 12 each : ca $ 600

(d) Scintillation probe, single cable type, with 25 meterscables to suit (a) and (b)

1" x 1" Na I (Tl) crystals 3 each : ca $ 800

1" x 2" Na I (Tl) crystals 3 each : ca $ 1000

(e) Strip chart recorders to suit (b) above with variable speed and voltage inputs.

6 each : ca $ 6000

Possible Suppliers :

a) M/s. Nuclear Enterprises Ltd., Bath Road, Beenham Reading RG7 5PE, England.

O R

Ludlund Measurements Co., Oak Street, Sweetwater, Texas, USA.

b) Ludlund Measurements Co.

c) Nuclear Development Associates, Shawnee Mission, Kansas, USA.

O R

T / M, Boston, massachusetts, USA.

d) Ludlund measurements Co.,

e) Linear Recorders, Irvine, California, USA.

Spares, cables, waterproof cases (geiger tubes) and enclosures (custom-made as required)	: ca $	5,000

2. Radiotracer Injection Equipment:

(a) Liquid injector to comprise

1) Hoke stainless steel double ended pressure - cylinder (2000 psi) 500 ml capacity 2 each	: ca $	500
2) ¼-in.2000 psi stainless steel needle valves. 4 each	: ca $	400
3) ¼-in. 2000 psi stainless steel quarter turn valves. 4 each	: ca $	400
4) Pressure gauges :		
0-600 psi 2 each	: ca $	100
0-1200 psi 2 each	: ca $	100
0-3000 psi 2 each	: ca $	100

(b) Gas injector to comprise.

1) 1-inch 2000 psi high pressure steel pipe pressure steel pipe(18-inch long) with O-ringed sealed joint, custom made. 2 each	: ca $	500
2) Needle valves as above 4 each	: ca $	400
3) quarter turn valves as above. 4 each	: ca $	400
4) Pressure gauges as above 4 each	: ca $	300

(c) Miscellaneous high pressure, Stainless steel fittings as pipe T's, elbows, nipples, swagelok or equivalent fittings, tubing etc., : $ 500

c) Constant rate injection pump : 2 each U$ 1000

Range of flow : a) 1ml to 40ml/minute
b) 10 ml to 500ml/minute

Constancy : ± 0.1%

Tubing : Silicone 50 feet each type 0.12" I.D. and 0.19" O.D.

7557-30 Masterflex drive with pump heads nos.7013, and 7015 will mee the requirement

Power requirment: Batter operation or 220V, 50-c/s AC

Suppliers : M/s. Cole Parmer Instrument Co.
7425, North Oak Park Avenue
Chicago, Illinois 60648
U.S.A.

3. SF_6 gas Leak Detector:

Tracer Gas : SF_6

Mode of Operation : Both continuous and chromatographic

Sensitivity : 10^{-11} cc/cc of ev with chromatographic modes & 10^{-9} cc/cc or ev in the continuous sampling mode

Detector : Electron activity chamber with a Nickel-63 source

Suppliers : M/s. A.I. Industrial
London Road, Pampisford
Cambridge
CB2 4EF
England

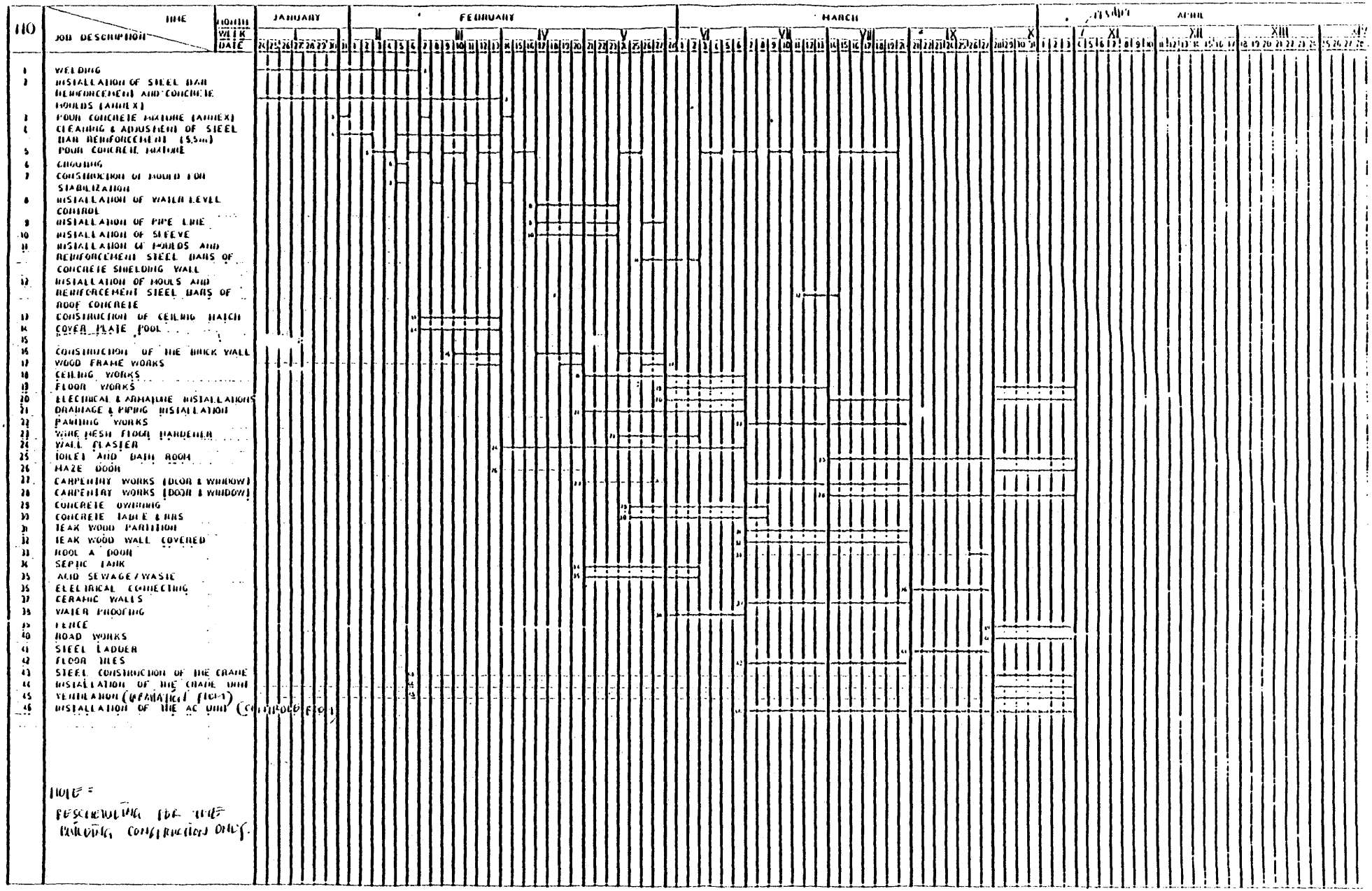
Estimated cost : $ 5000

(b) Chevron Leak Detector Kit, model 10 which includes SF_6 gas injection apparatus, a gas-liquid separation system and SF_6 detection apparatus with recorder. Complete package from Chevron Research Co., Richmond, California, USA.

$ 20,000

4.	3" x 3" well scintillation crystal (Na I) probe complete with photomultiplier, single cable.	: ca $ 1,500
5.	Teaching aids :	
a)	Portable video Recording system with camera, monitor & cassettes for permanent recording of field demonstrations.	: $ 3,500
b)	Photo-copying machine (Xerox) for permanent recording of field demonstration	: $ 5,000
6)	Freight & Insurance estimated at	: $ 5,000
7)	Replacement costs for equipment listed above and for other equipment existing in BARC for use within course frame-work, which may be damaged during the 5 year period of sub-project.	: $ 20,000
	Grand Total	: $ 95,000

Sub-Project Work Schedule: Radiation Vulcanization of Natural Rubber Latex



NOTE :
RESCHEDULING FOR TIME PERIOD, CONSTRUCTION ONLY.

Short Term Test-Evaluation Programme for RPV Latex (RPVL)

Introduction

In accordance with the decisions taken at the Working Group Meeting held in Takasaki in February 1983, it was agreed that the RRIM[1)] would supply latex to TRCRE and BATAN and to set up procedures for the following:

a) Technical assessment of RPV latex processability in coagulant and straight dipping.

b) Technical assessment/evaluation of irradiated latex films and films from dipped products.

Owing to technical and economic reasons, some minor changes are made with regard to the amount of latex to be irradiated. Accordingly, BATAN and TRCRE should irradiate appropriate amount of latex for each treatment studies, and using a suitable irradiation vessel. The total amount of latex to be irradiated is 160 litres in eight 10 litre batches. Each treatment (for a particular type of latex) is about 10 kg. Fifty-six litres of the irradiated latex, in eight 10 litre batches, will be sent to the RRIM for testings and evaluation. BATAN and RRISL will receive 12 litres of irradiated latex in eight 1.5 litre batches. The aggregation of the amount of irradiated latex for different types of testing is as follows:

Irradiated latex	Amount
Latex properties	2.5
Film properties	0.2
Processability	2.0
	4.7

1) Note: The Rubber Research Institute of Sri Lanka will be supplied irradiated latex for test-evaluation as a collaborative effort.

Work Schedule

The Work Schedule for the Test-Evaluation is shown in Table I.

Test Procedures

I. Standard

Assessment/evaluation of RPVL is to be carried out based on ISO standards and procedures. Attached are the appropriate test methods:

Ref. No.	Scope and field of application
ISO 471-1977	Methods of testing vulcanized rubber
ISO 37-1976(E)	Rubber, vulcanized - Determination of tensile stress-strain properties
ISO 188-1976(E)	Rubber, vulcanized - Accelerated ageing or heat-resistance tests
180 2285-1981(E)	Rubber, vulcanized - Determination of tension set at normal and high temperature
ISO 34-1979(E)	Rubber, vulcanized - Determination of tear stength

II. Cast Film

The irradiated latex is casted on a glass mould (170 mm by 150 mm or of about similar dimension). It is dried at 27°C at 65% relative humidity or at 23°C at 50% relative humidity or at prevailing temperature and humidity. The thickness of the dried film should be between 0.63 and 0.75 mm (Ref. ASTM D 1764-62 (1970). The film is leached for 24 hours in water at room temperature and subsequently oven dried at 70°C for 4 hours. The film is then given post-heat treatment at 100°C for 30 minutes. The film is then dusted using talc.

III. Processability

a) Coagulant dipping

The following coagulant solution should be used.

Ingredients	Parts by weight
Calcium nitrate	25
Water	25
Methylated spirits	50

A clean dry former is immersed in a coagulant solution and partially dried (at 70°C) to leave a uniform layer of coagulant over its surface. It is then immersed in the latex at the rate of 130 cm/min, allowed to dwell there for an appropriate time to obtain the required thickness and then slowly withdrawn at the rate of 60 cm/min. The thickness of the deposit should be between 0.3 mm - 0.6 mm. The wet gel deposit is leached in hot-water (70°C - 80°C) for about 30 minutes. It is then dried at 70°C in an air circulating oven until moisture content of less than 0.5% and followed by post-heat treatment at 100°C for 30 minutes. It is then dusted.

In order to conveniently determine the physical properties of the product, a glass plate of 180 mm x 90 mm x 5 mm (length x width x thickness) should be used as a former. The edges of the glass plate should be trimmed. A 200-cc. beaker is to be used to contain the latex.

The glass formers can be cleaned either by passing through hot dilute sulphuric acid or by scrubbing with dilute detergent solution, followed in each case by a water rinse.

b) Straight dipping

A clean dry former is immersed in the latex at the rate of 90 cm/min., and withdrawn at the rate of 60 cm/min (no dwell time).

The first latex layer is partially dried at 70°C after which the former is re-immersed in the latex at the rate of 90 cm/min., and withdrawn at the rate of 60 cm/min. The deposit is oven dried at 70°C. The product is then leached for 24 hours at room temperature, oven dried at 70°C until the moisture content is less than 0.5%, and then followed by post-heat treatment at 100°C for 30 minutes. It is then dusted.

c) Dipping characteristics

Dipping characteristics should be studied by using the former as described previously or using a boiling tube or other convenient means. The relation between deposit thickness and dwell times/ number of dips should be studied. The processing characteristics should also be noted from possible defects such as pin-holes, webbing, lamination etc.

IV. Ageing and Heat Resistance Tests

The test temperature is 70 ± 1°C for a duration of 166 to 168 hours. The test conditions for dry films and dipped products are similar. The tension set should be done at room temperature only. Stress at 500% strain should be studied for unaged samples only.

The irradiation conditions must be clearly specified when sending irradiated latex. Also, the test report should include all particulars as stated in the ISO standards.

V. Irradiation Procedures[2)]

a) Materials

HA and LA NR latex test materials are prepared by RRIM from the same clone and supplied to BATAN and TRCRE for irradiation using

2) Note: Reccommended by TRCRE

cobalt-60 gamma rays.

b) Methods

1. Ten kilo-grams of NR latexes are irradiated in the presence of carbon tetrachloride (CCl_4). The dose rate and the concentration of CCl_4 are listed in the attached Table 1.
2. CCl_4 is added to a well stirred NR latex without emulsifier and the latex is kept standing at least 16 hours before irradiation to ensure the complete dissolution of CCl_4 in NR particles.
3. The irradiation vessel is made of Pyrex glass and the capacity of the vessel is about 13 liters. The outer diameter and the height of the vessel are 22 cm and 40 cm, respectively.
4. Two vessels are used for the irradiation at the same time. Four days are necessary to irradiate 8 samples.
5. The average dose rate in the vessel is measured with a Cerium dosimeter. The maximum and minimum dose rates are also measured by using a Cobalt glass dosimeter.
6. The NR latex is stirred during irradiation with a convenient instrument.

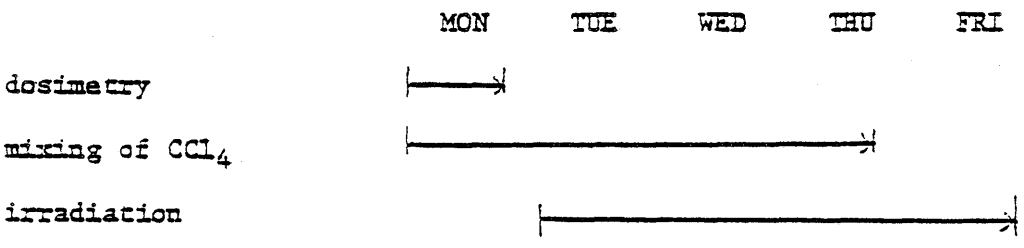
c) Time Schedule

The time schedule of this study is shown in Table 2.

Table 1 Irradiation conditions

No.	NR latex	dose(Mrad)	conc. of CCl_4(phr)
1	HA	2.5	3
2	HA	2.5	5
3	HA	3.5	3
4	HA	3.5	5
5	LA	2.5	3
6	LA	2.5	5
7	LA	3.5	3
8	LA	3.5	5

Table 2 Time schedule of irradiation*

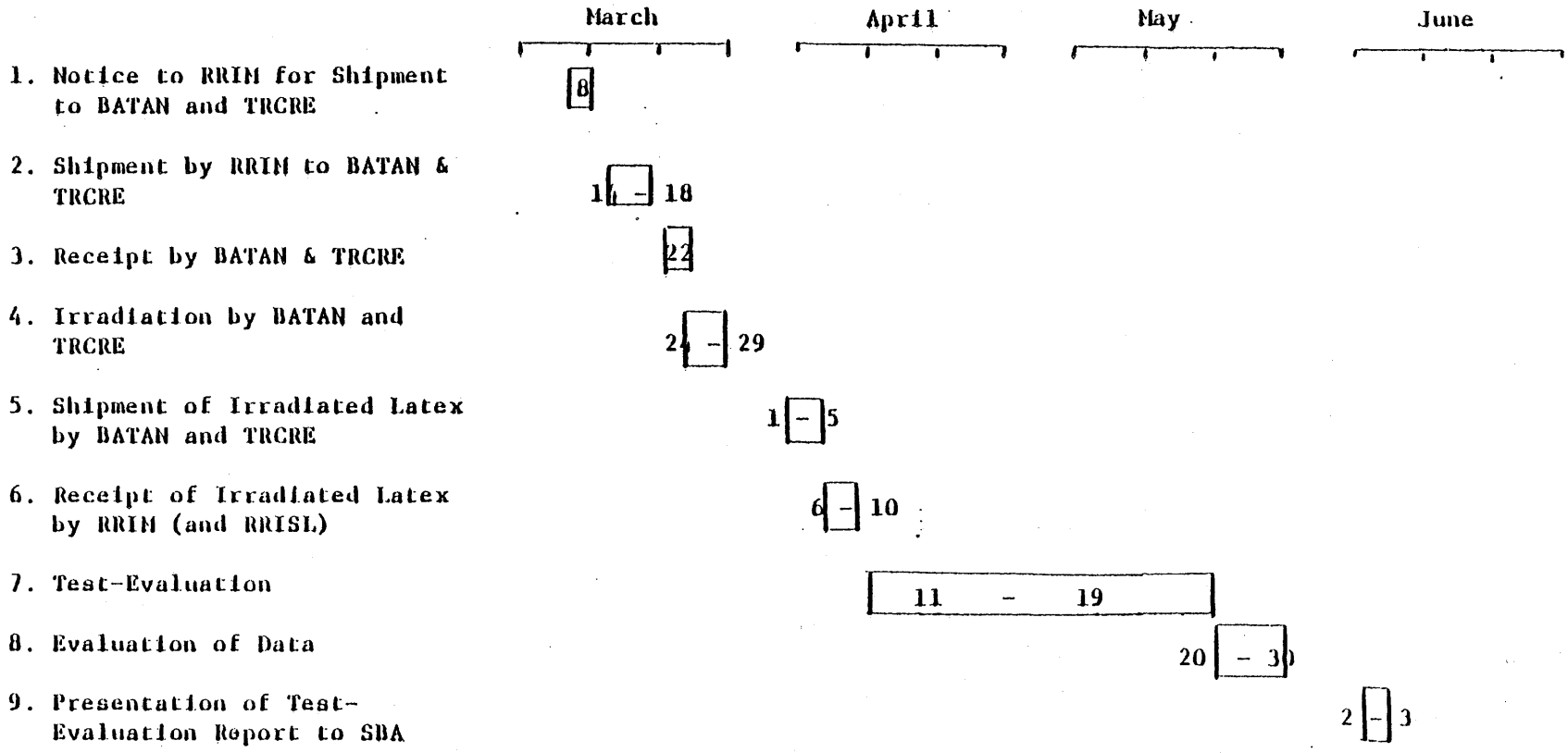


*At least ten days are necessary before irradiation for arranging the schedule of irradiation facility.

Table I

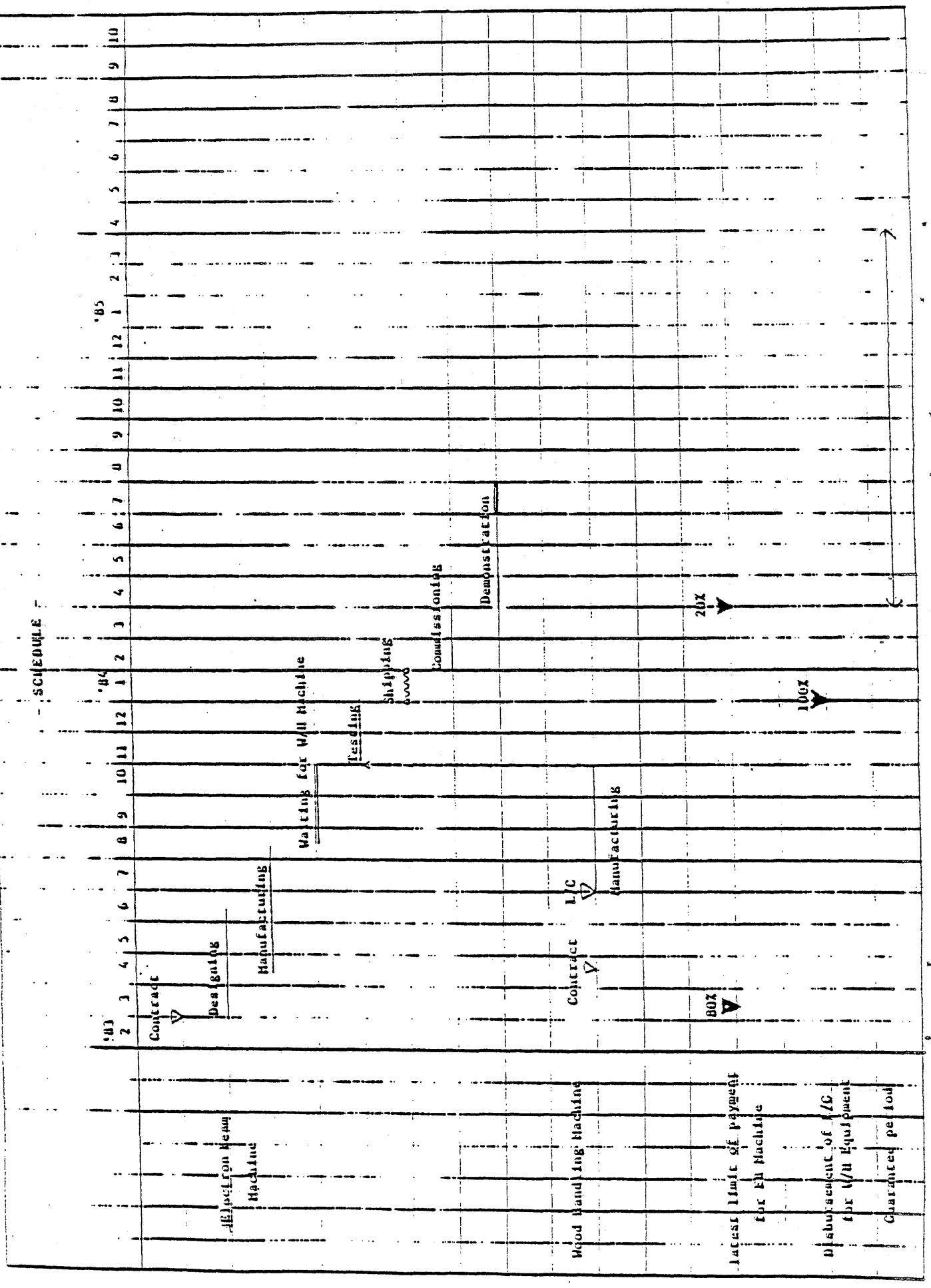
Short-Term Test-Evaluation Work Schedule

1983



APPENDIX 9

Sub-Project: Radiation Curing for Surface Coatings for Wood Products



D R A F T

29 March 1983

Sir,

I have the honour to inform you that the International Atomic Energy Agency and the United Nations Development Programme, in co-operation with the Governments of India and the Republic of Korea will conduct an advanced training course and demonstration on radiation sterilization of medical products. The advanced training-demonstration is scheduled for 26 September - 14 October 1983, is part of the "UNDP Regional (RCA) Project for Asia and the Pacific on Industrial Applications of Isotopes and Radiation Technology". Details about the training-demonstration, the specific schedule for 1983 and the requirements for participation are set forth in the attached Prospectus.

Your Government is invited to submit nominations for the training-demonstration through established official channels. We request that your Government give special attention and priority to nominating qualified persons from the medical products industry because of the specialized nature of the training-demonstration to be provided. At the same time nomination of persons from Government institutions directly involved with your country's medical products industry will also be considered. Nominations must be received by the International Atomic Energy Agency, Vienna by 1 July 1983. Nominations received after that date and applications sent directly by individuals or by private institutions cannot be considered. All nominations must also be accompanied by the standard IAEA personal history form.

Nominating Governments will be informed in due course of the names of the candidates who have been selected and at that time will be given full details of the procedures to be followed with regard to administrative and financial matters.

Accept, Sir the assurances of my highest consideration.

Carlos Vélez Ocón
Deputy Director General
Department of Technical Co-operation
for DIRECTOR GENERAL

Prospectus

Title:	UNDP Regional (RCA) Industrial Training-Demonstration on Radiation Sterilization of Medical Products
Place:	Bhabha Atomic Research Centre, Bombay, India and the Korea Advanced Energy Research Institute, Seoul, Republic of Korea
Date:	26 September to 7 October 1983 in India; 10 - 14 October 1983 in the Republic of Korea
Deadline for Nominations:	1 July 1983
Organizations:	International Atomic Energy Agency and the United Nations Development Programme in co-operation with the Governments of India and the Republic of Korea
Language:	English
Purpose:	The purpose of the Training Course is to provide basic training in and experience in radiation processing technology relevant to sterilization of medical products and to demonstrate the application of this technology in commercial practice. The Course is the first of three training-demonstration activities planned during the 1982-86 term of the UNDP Regional (RCA) Project for Asia and the Pacific on Industrial Application of Isotopes and Radiation Technology.
Participation and Selection Procedure:	The Course will be limited to twelve persons from Project participating Governments in Asia and the Pacific with priority given to persons from the medical products industry in the Region.
Participant's Qualifications:	Nominations from Government institutes and universities shall be persons having industrial development and technology transfer responsibilities associated with medical products industry. Prerequisites shall include a university degree or equivalent in the physical or biological sciences or engineering, and at least two years operating experience in medical products industry.

Nature of Training Course: The Training Course will emphasize basic aspects of radiation sterilization technology applied to the medical products industry. The demonstration will provide intensive in-plant training at a near commercial level in which participants will take part in the operation and use of the Pilot Plant.

The first two weeks of the basic training will take place in India. It will consist of lectures and experiments on basic radiation physics and engineering, packaging materials, microbiology, disposable medical supplies and pharmaceuticals, market systems and product development.

The one week in-plant demonstration will take place in the Republic of Korea. Lectures will be given on radiation effects on medical products, dosimetry, radiation biology, plant management and operation, maintenance and trouble shooting as well as commercial and economic factors.

Schedule and Location of Advanced Training-Demonstration for Radiation Sterlization of Medical Products

Locations	Date
1. Bhabha Atomic Research Centre Bombay, India	26 September - 7 October 1983
2. Korea Advanced Energy Research Institute, Seoul, Republic of Korea	10 - 14 October 1983

INTERNATIONAL ATOMIC ENERGY AGENCY
AGENCE INTERNATIONALE DE L'ENERGIE ATOMIQUE
МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ
ORGANISMO INTERNACIONAL DE ENERGIA ATOMICA

WAGRAMERSTRASSE 5, P.O. BOX 100, A-1400 VIENNA, AUSTRIA, TELEX: 1-12645, CABLE: INATOM VIENNA, TELEPHONE: 2360

IN REPLY PLEASE REFER TO:
PRIERE DE RAPPELER LA REFERENCE:

14 December 1982

Sir,

I have the honour to invite the Government of â to nominate a participant to attend the UNDP Industrial Project Special Training Demonstration of paper manufacture using a nuclear control system scheduled from 28 March to 16 April 1983, Ban Pong, Thailand and Tokyo, Japan. This is the second of five Special Training Demonstrations planned during the 1982-1986 term of the Regional (RCA) Project for Asia and the Pacific on Industrial Applications of Isotopes and Radiation Technology.

The Special Training-Demonstration activities will be carried out in two parts. A two week Demonstration programme will be held from 28 March to 9 April 1983 at the Siam Kraft Paper Company (SKPC), Ban Pong, Thailand. The Demonstration will be carried out by SKPC in co-operation with the Government of Thailand. A prospectus outlining the demonstration activities is attached. This will be followed by a one week Workshop scheduled for 10-16 April 1983 at the Japan Atomic Industrial Forum (JAIF) held under the auspices of the Government of Japan.

The purpose of the UNDP Special Training-Demonstration is to provide practical knowledge and experience sufficient to equip participants from paper manufacturing companies to assist in technology transfer and application in the Region. Accordingly the Agency in its selection of participants for the Demonstration will give first priority to individuals employed in the Region's paper industry and nominated by RCA Governments. At the same time we wish to recognize the importance of counterpart officers from Government institutions who will be directly involved in industrial technology transfer under the Regional UNDP Project and we encourage their participation in the Special Training-Demonstration.

It would be appreciated if your Government's nomination could be received by the IAEA by 15 February 1983. All local arrangements for the Training-Demonstration activities will be managed by the Office of Atomic Energy for Peace (OAEP), Bangkok, and the Japan Atomic Industrial Forum (JAIF), Tokyo. Following the selection of participants by the IAEA, your

Attachment

â

Government will be informed of all local plans for the Special Training-Demonstration by the Secretary General of OAEP and the Executive Managing Director of JAIF.

In order to keep our National Counterpart to this Project in your country informed, we are sending a copy of this letter to Mr. â .

Accept, Sir, the assurances of my highest consideration.

Carlos Vélez Ocón
Deputy Director General
Department of Technical Co-operation
for DIRECTOR GENERAL

P r o s p e c t u s

Title: Second UNDP Training-Demonstration Workshop on the Use of Nucleonic Control Systems in the Paper Industry

Place: Ban Pong, Thailand and Tokyo, Japan

Date: 28 March - 16 April 1983

Deadline for nominations:

15 February 1983

Organizers:

International Atomic Energy Agency and the United Nations Development Programme in co-operation with the Governments of Japan and Thailand, the Japan Atomic Industrial Forum and the Siam Kraft Paper Company.

Language: English

Purpose:

The purpose of the Special Training-Demonstration is to provide background and experience in the use of nucleonic systems in the paper industry, their design; operating characteristics and maintenance strategies.

This is the second of five training-demonstration activities planned during the 1982-1986 term of the Regional RCA Project for Asia and the Pacific on Industrial Application of Isotopes and Radiation Technology.

Participation and Selection Procedure:

The Workshop will be limited to 10 participants from developing RCA Member States in Asia and the Pacific with first priority given to the selection of participants from the paper industry in the Region.

Participants' qualification:

Participants shall be drawn from Regional Paper Companies and from Government Institutes having industrial development and technology transfer responsibilities. Prerequisites shall include formal training and/or experience in industrial process control methods and instrumentation, electronics, industrial production and quality control practice with emphasis on paper production.

Nature of the Special Training-Demonstration:

The Special Training-Demonstration will emphasize practical aspects of use of nucleonic control systems in the paper industry including technical, engineering and economic factors. Background will be provided in basis nucleonics, electronics, design engineering, operating characteristics and maintenance strategies to be followed for various types of industrial nucleonic systems. Case studies will be reviewed to demonstrate practical economics in the use of such systems in actual paper manufacturing and industrial production operations. The Demonstration will emphasize the practical aspects of use of nucleonic control systems involving actual in-plant use.

The first two weeks of the Workshop will take place at the Siam Kraft Paper Company (SKPC), Ban Pong, Thailand, and will involve participation in all aspects of paper manufacture, process control as well as product quality inspection practices. Production-economic output data under conditions at the SKPC plant will be reviewed and analyzed. The third week of the Workshop in Tokyo, Japan will focus on lectures on applied characteristics, maintenance strategies and discussions of practical economics of such applications, including investments in equipment and payout in terms of savings in raw materials, energy, plant down time, and improved product quality control. Visits will also be made to industrial plants and factories using nucleonic instruments for paper production-manufacturing purposes.

Financial Arrangements:

Selected participants will receive from the IAEA a stipend of US$45.00 per day in Thailand and US$70.00 per day in Japan. The IAEA will also provide the participants' round-trip air tickets, economy class, from their home countries to Bangkok, Tokyo and return.

PROGRAMME

THE RCA/UNDP TRAINING-DEMONSTRATION WORKSHOP ON THE USE OF NUCLEONIC CONTROL SYSTEM FOR PAPER MANUFACTURE

AT

The Siam Kraft Paper Company, Ban Pong, THAILAND

March 27 - April 9, 1983

Sunday, March 27, 1983

	- Participants Arrive BKK and travel to Guest house, Banpong
16.30 - 17.00	- Registration
17.00 - 19.00	- Orientation
19.00 - 21.00	- Dinner Reception

Monday, March 28, 1983

09.00 - 09.15	- Welcome Address by Thai Government Official
	- Welcome Address by SKPC's General Manager
	- Open Remarks by an IAEA Official
09.15 - 10.00	- Coffee Break
10.00 - 12.00	- Fundamental of Paper Making I
12.00 - 13.00	- Luncheon
13.00 - 15.00	- Fundamental of Paper Making II
15.00 - 15.15	- Coffee Break
15.15 - 17.00	- Radiation, Detection and Measurement Lab.

Tuesday, March 29, 1983

08.00 - 10.00	- Basic Functions of NCS
10.00 - 10.15	- Coffee Break
10.15 - 12.00	- Introd. of SKPC's NCS
12.00 - 13.00	- Luncheon
13.00 - 15.00	- Introd. of SKPC's NCS (Cont.)
15.00 - 15.15	- Coffee Break
15.15 - 17.00	- System Observation

Wednesday, March 30, 1983

08.00 - 10.00	- Radiation Safety and Health Physics
10.00 - 10.15	- Coffee Break
10.15 - 12.00	- Radiation Safety and Health Physics
12.00 - 13.00	- Luncheon
13.00 - 15.00	- Quality Inspection Practice
15.00 - 15.15	- Coffee Break
15.15 - 17.00	- Quality Inspection Lab. Tour

Thursday, March 31, 1983

08.00 - 10.00	- Interpretation of Computer Outputs
10.00 - 10.15	- Coffee Break
10.15 - 12.00	- Interpretation of Computer Outputs
12.00 - 13.00	- Luncheon
13.00 - 15.00	- Interpretation of Computer Outputs
15.00 - 15.15	- Coffee Break
15.15 - 17.00	- Interpretation of Computer Outputs

Friday, April 1, 1983

08.00 - 10.00	- Grade Change Lecture
10.00 - 10.15	- Coffee Break
10.15 - 12.00	- Grade Change Lab
12.00 - 13.00	- Luncheon
13.00 - 15.00	- Issued in Overcoming the Introduction of MCS
15.00 - 15.15	- Coffee Break
15.15 - 17.00	- Issued in Overcoming the Introduction of MCS

Saturday, April 2, 1983

08.00 - 10.00	- Preventive Maintenance of MCS
10.00 - 10.15	- Coffee Break
10.15 - 12.00	- Preventive Maintenance of MCS
12.00 - 13.00	- Luncheon
13.00 - 15.00	- Economic Calculation
15.00 - 15.15	- Coffee Break
15.15 - 17.00	- Case Studies (Kraft - Multiply Paper)

Sunday, April 3, 1983

- Sight Seeings
  (TOUR RIVER KWAI, KACHANABURI PROVINCE)

Monday, April 4, 1983

08.00 - 10.00	- Case Studies
10.00 - 10.15	- Coffee Break
10.15 - 12.00	- Case Studies
12.00 - 13.00	- Luncheon
13.00 - 15.00	- Case Studies
15.00 - 15.15	- Coffee Break
15.15 - 17.00	- Discussion and Conclusions on Economic Calculation

Tuesday, April 5, 1983

09.00 - 11.00	- Visit the Office of Atomic Energy for Peace (OAEP)
11.00 - 12.00	- Luncheon
12.30 - 15.00	- Visit Good Year Plant

Wednesday, April 6, 1983 (National Holiday)

- Sight Seeings
  (TOUR BANGKOK)

Thursday, April 7, 1983

09.00 - 12.00	- Visit Thai Union Paper Mill
12.00 - 13.00	- Luncheon
13.00 - 17.00	- Visit Thai-Scott Paper Mill

Friday, April 8, 1983

08.00 - 10.00	- Discussion & Recommendation
10.00 - 10.15	- Coffee Break
10.15 - 12.00	- Closing
12.00 - 13.00	- Luncheon
13.00 - 17.00	- Free
19.00	- Farewell Party

Saturday, April 9, 1983

- Depart for Japan

17 February 1983

Program for Second RCA/UNDP Training-Demonstration Workshop on the Use of Nucleonic Control Systems in the Paper Industry 10 April - 15 April, Japan

Saturday, 9 April

21:10	Arrival Tokyo from Bangkok by TG-600
	Stay in Tokyo

Sunday, 10 April

	Free
	Stay in Tokyo

Monday, 11 April

10:00 - 10:30	Welcome Remarks by Government and JAIF representatives
10:30 - 11:30	Orientation and General Lecture on Paper Gauging in Japan by Course Director: C. Honma Senior Engineer Honshu Paper Co.
12:40	Lv. Tokyo by train
14:25	Ar. Fuji
14:40 - 17:00	Visit Paper Machine Manufacturing Plant in Fuji city, Shizuoka (Kobayashi Seisakusho Ltd.)
	Stay in Fujinomiya

Tuesday, 12 April

09:30 - 13:30	Visit Harada Mill, Mishima Paper Co.
14:00 - 17:00	Tenma Paper Mills and Co.
18:09	Lv. Fuji by train
20:16	Ar. Tokyo
	Stay in Tokyo

Wednesday, 13 April

09:40	Lv. Haneda (Tokyo) by air plane (JL505)
11:05	Ar. Chitose (Sapporo)
13:00 - 16:00	Visit Yufutsu Mill of Sanyo-Kokusaku Pulp Co.

Stay in Tomakomai

Thursday, 14 April

10:00 - 14:00	Visit Tomakomai Mill, Oji Paper Co.
16:00	Lv. Chitose by air plane (JL-516)
17:30	Ar. Haneda (Tokyo)

Stay in Tokyo

Friday, 15 April

09:30 - 12:15	Visit Yokogawa Electric Works
13:30 - 17:00	Wrap-up Discussion (technical points)
17:30 - 19:30	Dinner Meeting

Stay in Tokyo

Saturday, 16 April

Departure from Japan

Participants to the Second UNDP Training-Demonstration on the Use of Nucleonic.Control Systems in the Paper Industry, 28 March - 16 April 1983, San Pong and Tokyo

Bangladesh	Mr. Md Abdur Rashid Khan Deputy General Manager Chemical Industries Corp.
India	Mr. Pk John Head, Instrumentation Dept. Kerala Newspring Project Hindustan Paper Corp.
	Mr. Shyam Jha Head, Instrumentation Dept. Nowgong Paper Project Hindustan Paper Corp.
Indonesia	Mr. Moh. Ridwan Paper Factory Bekasi
Rep. of Korea	Mr. Bo Wong Kang Assistant Manager Hankuk Paper Co.
Malaysia	Mr. Ang Lee Yang Mill Manager Paper Products
Philippines	Mr. Nilo M Sayenga Utilities Instrumentation Service Scott Paper Philippines Inc.
Singapore	Ms. Jobyna Tan Suat Teng Lamipak Industries Private Limited
Sri Lanka	Mr. Kandiah Tharumalingam Assistant Engineer National Paper Corp. of Sri Lanka
Thailand	Mr. Iad Soonthornarrom Thai Union Paper Mill Co.
	Mr. Vilas Demanop The Siam Kraft Paper Co.
	Mr. Pornchai Choowongvitaya The Siam Kraft Paper Co.

DRAFT 18 March 1983

Sir,

I have the honour to inform you that the International Atomic Energy Agency and the United Nations Development Programme, in co-operation with the Governments of Australia and the Philippines and the Philex Mining Corporation will conduct an advanced training course and demonstration in the use of nucleonic systems in the minerals industry. The advanced training-demonstration, to begin 28 August 1983, and of four months duration, is part of the "UNDP Regional (RCA) Industrial Project". Details about the training-demonstration and the requirements for participation are set forth in the attached Prospectus.

Your Government is invited to submit nominations for the training-demonstration through established official channels. We request that your Government give special attention and priority to nominating qualified persons from the minerals industry because of the specialized nature of the training-demonstration to be provided. At the same time nomination of persons from Government institutions directly involved with your country's minerals industry will also be considered. Nominations must be received by the International Atomic Energy Agency, Vienna by 1 July 1983. Nominations received after that date and applications sent directly by individuals or by private institutions cannot be considered. All nominations must be accompanied by the standard IAEA personal history form.

Nominating Governments will be informed in due course of the names of the candidates who have been selected and at that time will be given full details of the procedures to be followed with regard to administrative and financial matters.

Accept, Sir the assurances of my highest consideration.

Carlos Vélaz Ocón
Deputy Director General
Department of Technical Co-operation
for DIRECTOR GENERAL

Prospectus

Title:	UNDP Regional (RCA) Industrial Training-Demonstration - On-stream Analysis and Control of Mineral Concentrators employing Nucleonic Systems.
Place:	Sydney and Brisbane, Australia; Manila and Baguio City, Philippines.
Date:	28 August to 24 September 1983 in Australia; 25 September to 17 December 1983 in Philippines or 8 January to 31 March 1984 in the Philippines.
Deadline for Nominations:	1 July 1983.
Organisers:	International Atomic Energy Agency and the United Nations Development Program in cooperation with the Governments of Australia and the Republic of the Philippines; the Commonwealth Scientific and Industrial Research Organization of Australia, the Julius Kruttschnitt Mineral Research Centre of the University of Queensland and the Australian Mineral Development Laboratories; the Philippine Atomic Energy Commission and the Philex Mining Corporation of the Philippines.
Language:	English.
Purpose:	The purpose of the Training Course is to provide background and experience in the use of nucleonic systems for on-stream analysis of mineral slurries, and the application of these systems to control of mineral concentrators. The Course is the first of two training-demonstration activities planned during the 1982-86 term of the UNDP Regional (RCA) Project for Asia and the Pacific on Industrial Application of Isotopes and Radiation Technology.
Participation and Selection Procedure:	The Course will be limited to twelve persons from participating Governments in Asia and the Pacific with priority given to persons from the mineral industry in the Region. Persons from Government institutes and universities having industrial development and technology transfer responsibilities will also be considered.
Participants' Qualifications:	Prerequisites shall include a university degree or equivalent in metallurgical or chemical engineering, at least two years operating experience in a mineral concentrator, and currently to be working in the minerals industry.

Nature of Training Course:

The Course will emphasise practical aspects of use of nucleonic on-stream analysis systems and other control systems used in the mineral industry including technical, engineering and economic factors. It will provide intensive in-plant training on control of a copper flotation concentrator in which participants will take part in development of control strategies.

The first four weeks of the Course will take place in Australia. Two of these weeks will consist of lectures and experiments on basic nucleonics, electronics, and application of nucleonic systems to mineral processing; the third week includes visits to the manufacturer of the on-stream analysis system and to a concentrator in which this system is operating, and the fourth week will consist of lectures and experiments relating to control of mineral concentrators.

Twelve weeks will be spent in the Philippines: one of these weeks will involve a course relating to on-stream analysis at the Philippine Atomic Energy Commission. The rest of the time will be spent at Philex Mining Corporation's Banget concentrator where participants will work directly with staff of the Julius Kruttschnitt Mineral Research Centre in improving control using information from on-stream analysis and other sensors. Half of the participants will spend three months in the Philippines in the last quarter of 1983, and the other half in the first quarter of 1984.

Schedule and Location of Advanced Training-Demonstration for Mineral Industry

Locations	Date
1. CSIRO Division of Mineral Physics and co-operating organizations, Lucas Heights, NSW, Australia	28 August - 24 September 1983
2. Philippine Atomic Energy Commission, Quezon City, Philippines	25 - 30 September 1983 or 8 - 13 January 1984
3. Philex Mining Corporation, Baguio City, Philippines	1 October - 17 December 1983 or 14 January - 31 March 1984

1983 RCA ACTION PLAN

INTERNATIONAL ATOMIC ENERGY AGENCY

INTEROFFICE MEMORANDUM

TO: The Director General

DATE January 19, 1983

OUR REF.:

FROM: M. Zifferero
DDG-RI

YOUR REF.:

SUBJECT: 1983 RCA Action Plan

Attached for your approval is the recommended 1983 RCA Action Plan in the amount of US$3,448,238 (Ref. Table 1). Current and planned participation in individual projects by Member States is shown in Table 2.

Of the planned budget, US$2,876,238 is projected as third-year costs under the UNDP Project for Asia and the Pacific on Industrial Applications of Isotopes and Radiation Technology.

An amount of US$572,000 will be required in 1983 for research contracts and project review meetings. This amount compares to the 1982 estimated costs of US$504,000.

For 1983, the recommended allocation of funds for research contracts and project meetings is as follows:

1.	Regular Agency Research Contract Budget	US$397,000
2.	RCA Member States Contributions	US$175,000
	A. Government of Australia	US$55,000
	B. Government of India	50,000
	C. Government of Japan	70,000

The Government of Australia is expected to make a total cash contribution of approximately US$352,097 to support RCA projects in the 1983 fiscal year. These funds will be used to support the Regional Cooperative Research Project on Isotope Applications to Hydrology and Sedimentology at a level of US$55,000 in cash, and the balance will be used for the UNDP Project on Industrial Applications of Isotopes and Radiation Technology.

The Representative of India announced at the 11th RCA Meeting in September 1982 that his Government would make a special contribution to RCA in the amount of US$50,000 in 1983. These funds will be used to support new regional cooperative research projects on basic sciences using nuclear research reactors and ^{99m}Tc generator systems.

The Government of Japan is expected to make a total contribution in cash and kind of approximately US$560,320 to support RCA projects in 1983. The funds will be used to support the Regional Cooperative Research Projects on Food Irradiation, Cancer Therapy and Nuclear Medicine, at a level of US$70,000 in cash, and the balance will be used for the UNDP Project on Industrial Applications of Isotopes and Radiation Technology in cash and kind.

A full UNDP proposal entitled "Regional RCA Project for Asia and the Pacific on Industrial Applications of Isotopes and Radiation Technology" was implemented on April 1, 1982. The project targets an expenditure of US$12,462,413 over its 8-year term from 1980 to 1987. In 1982, the sub-projects on Radiation processing, Nucleonic Control Systems, Non-destructive Testing and Nuclear Instrument Maintenance were fully implemented. The 1983 UNDP project expenditures are estimated at US$2,876,238.

The 10th anniversary of RCA was celebrated in conjunction with the Fourth RCA Working Group Meeting in Kuala Lumpur, with a dedication of invited lectures by distinguished speakers of several Member States.

Implementation of a new programme on Medical Applications of Nuclear Techniques was urged by the Member States at the 10th RCA Meeting in 1981, and the draft project proposal prepared by the Secretariat was fully supported by RCA Countries at the 4th RCA Working Group Meeting and the 11th RCA Meeting in 1982. This draft proposal comprised four fields, including cancer therapy, nuclear medicine for thyroid and liver diseases, diagnosis of parasitic diseases, and ^{99m}Tc generator systems. The first phase of the project will be funded by the Agency, India and Japan in 1983.

The Government of Viet Nam informed the Agency in October 1982 of its participation in five RCA projects, including the UNDP Industrial Project, Food Irradiation, Hydrology and Sedimentology, Nuclear Instrument Maintenance, and Nuclear Medicine.

A Summary Report of the 11th Meeting of Representatives of RCA Member States, which includes progress reports of approved RCA projects, is attached as Appendix 1.

Table 1

1983 RCA ACTION PLAN

Estimated Costs

Project Title	Project Officer	1982 Total Costs	1983 Total Costs Contracts, meetings, etc.)	1984-1987
UNDP Project on Industrial Applications of Isotopes and Radiation Technology	E.E. Fowler	$2,996,626	$2,376,238[1]	$4,158,134
The Use of Induced Mutations for Improvement of Grain Legume Production	A. Micke	71,000	80,000	80,000
Food Irradiation	P. Loaharanu	80,000	40,000[2]	420,000[7]
Nuclear Techniques to Improve Domestic Buffalo Production	J. Dargie	52,000	44,000	200,000[8]
Sterilization of Biological Tissue Grafts	R. Mukherjee	19,000	35,000	160,000
Health-related Environmental Research	S. M'Baku	48,000	30,000	140,000
Nuclear Instrument Maintenance	P. Vuister	65,000	45,000	200,000
Basic Science using Research Reactors	R. Muranaka	-	40,000[3]	150,000
Isotope Applications in Hydrology and Sedimentology	B. Payne	95,000	55,000[4]	110,000
Semi-Dwarf Mutants for Rice Improvement	T. Kawai	50,000	68,000	200,000
Biogas from Agricultural Residues*	O. Lindquist	-	-	-
Improvement of Cancer Therapy	T. Iwasaki	-	48,000[5]	522,000[9]
Nuclear Medicine for Thyroid and Liver Diseases	B. Vavrejn	-	30,000[5]	460,000[9]
Nuclear Techniques for Tropical Parasitic Diseases	J. Cascelino	-	31,000	108,000[9]
Development of ^{99m}Tc Generator Systems	H. Vera Ruiz	-	22,000[6]	448,000[9]
Working Group Meeting	S. Machi	4,000	4,000	16,000
		$3,300,626	$3,448,238	$7,372,134

1) The Project on Industrial Applications of Isotopes and Radiation Technology is funded by UNDP at a level of $841,333; by RCA Governments at a level of US$1,887,417; by Industries at a level of US$147,258. The Government of Japan has made a cash contribution of US$195,900 in 1981-82, and is expected to make a contribution of US$490,320 in cash and kind in 1983. The Government of Australia has made a cash contribution of US$8,000 and is expected to make a contribution of US$497,097 in 1983.

2) The Government of Japan has made a cash contribution of US$216,000 from 1980 to 1982 and is expected to make a contribution of US$40,000 in 1983.

3) A special contribution by the Government of India of US$40,000 will fund the new project on basic sciences using research reactors.

4) The Government of Australia has made a contribution in the years 1979-1982 totalling US$170,000 and is expected to make a contribution of US$55,000 in 1983.

5) Part of the cost will be borne by an expected contribution by the Government of Japan of US$30,000 for medical and biological applications in 1983.

6) A special contribution of the Government of India of US$10,000 will be used to fund a part of the project cost.

7) Phase II of the project concerning pilot-scale research and development will be initiated in 1984 subject to availability of funds and contributions from RCA Governments and donors.

8) Phase II of the project concerning improvement of buffalo production will be initiated in 1984.

9) Includes training courses in Phase II of the projects.

* Approved pending availability of funds.

Table 2

RCA REGIONAL COOPERATIVE PROJECTS

Project Title	Participants												
	Australia	Bangladesh	India	Indonesia	Japan	Korea, Rep.	Malaysia	Pakistan	Philippines	Singapore	Sri Lanka	Thailand	Viet Nam
1. Use of induced mutations for the improvement of grain legume production		X	X	X		X	X	X	X		X	X	
2. Food irradiation		X	X	X	X	X	X	X	X		X	X	(X)
3. Use of nuclear techniques in improving buffalo production	X	X	X	X			X		X		X	X	
4. Radiation sterilization of medical supplies	X	X	X	X		X		X	X			X	
5. Health-related environmental research		X	X	X	X	X	X	X	X	X		X	
6. Maintenance of nuclear instruments		X	X	X		X	X	X	X		X	X	(X)
7. Isotope applications in hydrology and sedimentology	X			X		X	X					X	(X)
8. Semi-dwarf mutants for rice improvement		X	X	X	X	X	X	X	X		X	X	X
9. Industrial applications of isotopes and radiation technology (UNDP)	X	X	X	X	X	X	X	X	X	X	X	X	(X)
*10. Cancer therapy		X	X		X	X	X	X	X	X	X	X	
*11. Nuclear medicine	X	X	X	X	X	X	X	X	X	X	X	X	X
*12. Parasitic diseases		X	X	X			X	X	X		X	X	
*13. Tc-99m generators	X	X	X	X		X	X	X	X		X	X	

( ) Subject to negotiation * Expected participants

1984 RCA COST PROJECTION

Project Title	1983 Total Costs	1984 Total Costs
UNDP Project on Industrial Applications of Isotopes and Radiation Technology	2,759,668	$1,802,759 1)
The Use of Induced Mutations for Improvement of Grain Legume Production	80,000	73,000
Food Irradiation	40,000	82,500 2)
Nuclear Techniques to Improve Domestic Buffalo Production	44,000	85,000
Sterilization of Biological Tissue Grafts	35,000	30,000
Health-related Environmental Research	30,000	74,000
Nuclear Instrument Maintenance	45,000	60,000
Basic Science using Research Reactors	40,000	40,000 3)
Isotope Applications in Hydrology and Sedimentology	55,000	25,000
Semi-dwarf Mutants for Rice Improvement	68,000	73,000
Improvement of Cancer Therapy	48,000	130,000 4)
Biogas from Agricultural Residues*	-	-
Nuclear Medicine for Thyroid and Liver Diseases	30,000	155,000 5)
Nuclear Techniques for Tropical Parasitic Diseases	31,000	40,000
Development of 99m-Tc Generator Systems	22,000	50,000 6)
Working Group Meeting	4,000	4,000
TOTAL	$3,331,668	$2,724,259

1) The Project on Industrial Applications of Isotopes and Radiation Technology is funded by UNDP at a level of $630,200; by RCA Governments at a level of US$1,025,290; and by industries at a level of US$147,269.

2) Cost until August 1984 including 1983 cost, funded by Japan contribution.

3) A special contribution by the Government of India of US$40,000 will fund the project.

4) Part of the cost will be borne by an expected contribution by the Government of Japan. Includes one training course ($80,000), funded by IAEA.

5) Includes one training course costing US$90.000, funded by IAEA.

6) A special contribution of the Government of India of US$10,000 will be used to fund a training workshop.

* Approved pending availability of funds.

September 21, 1982

REVISED DRAFT

WORK PLAN FOR THE PROJECT ON MEDICAL AND BIOLOGICAL APPLICATIONS OF NUCLEAR TECHNIQUES

The Project will be carried out in three phases:

Phase I: 1983–1985 — Cooperative research projects to develop the most suitable techniques for the region and general training for established techniques.

Phase II: 1984–1987 — Training programmes to transfer the techniques established in Phase I.

Phase III: 1986–1989 — Establishment of a demonstration training centre in the region (subject to further assessment).

PHASE I (1983 - 1985)

1. Radiation Therapy in Cancer

a) Cooperative research project on the improvement of therapeutic gain using conventional machines by the study of irradiation schedules, combined treatments of radiation and chemical and/or physical means.

10 contracts over a 4-year term (1982 - 1985)	$200,000
4 coordination committees	50,000
	$250,000

b) Training workshop on "Radiation Therapy in Cancer". To be held in Japan in 1983, organized by JICA for RCA countries. The purpose will be to train medical doctors through lectures, visiting laboratories, information exchange, and discussions.

10-15 participants, 3 weeks	$80,000
1983, Japan	(JICA)

2. Nuclear Medicine for Liver and Thyroid Diseases

a) Cooperative research project on the establishment of nuclear medicine methodologies for diagnosis and treatment of thyroid and liver diseases.

10 contracts over a 2-year term (1983-84)	$100,000
2 coordination committees	30,000
	$130,000

b) Training workshop on "Nuclear Medicine". To be organized by JICA in 1984 for RCA to train medical doctors in nuclear medicine procedures.

10 - 15 participants, 5 weeks	$ 80,000
(1984 Japan)	(JICA)

3. Nuclear Techniques for Tropical Parasitic Diseases

Cooperative research project to establish a final procedure for immunoradiometricassay for diagnostic tests in parasitic diseases, including schistomiasis, filarias and malaria.

11 contracts for one year	$33,000
Supply of antibody	5,000
Computer cost	3,000
Coordination meeting	15,000
Evaluation meeting	15,000
(1983 - 1984)	$71,000

4. Preparation of radiopharmaceuticals

Cooperative research project on the development of a Tc-99m generator system using low specific activity (n, γ)-produced Mo-99 in low power reactors.

Research contracts over a 3-year term	$ 105,000
Three coordination committees	45,000
Supply of two sets of prototype	20,000
(1983-1985)	$ 170,000

PHASE II (1984-1987)

Training courses on sub-projects to transfer technology through training medical doctors and medical physicists who will be the core people in the respective countries.

1. Training workshops on radiation treatment of cancer of the uterus using remote and manual after-loading techniques

10 participants, four weeks	$ 80,000 (1984) (including equipment)
Pakistan, where both manual and remote after-loading equipment is available	$ 80,000 (1986)
(1984, Pakistan)	$160,000
(1986, Sri Lanka)	

2. Training courses on diagnosis and cancer therapy by using CT and Linac for medical physicists and doctors

10 participants, 3 weeks	
(1985, Singapore)	$ 80,000
(1987, Japan)	80,000
	$160,000

3. Training courses on nuclear medicine for liver and thyroid diseases

15 participants, 6 weeks	
(1984, Thailand)	$ 90,000
(1985, Malaysia)	90,000
(1986 Indonesia)	90,000
(1987, Philippines)	90,000
	360,000

4. Training courses on nuclear techniques for diagnosis of tropical parasitic diseases

15 participants, 2 weeks	
(1985, Indonesia)	$ 35,000
(1986,	35,000
	$ 70,000

5. Training courses on preparation, control, and utilization of ^{99m}Tc and ^{131}I labelled radiopharmaceuticals

15 participants, 3 weeks	
(1985, Australia)	$ 60,000
(1987, India)	60,000
	$120,000

6. Training courses on the preparation, control, and utilization of radioimmunoassay kits

15 participants, 3 weeks	
(1984, Australia)	$ 60,000
(1986, Malaysia)	60,000
(1987, Thailand)	60,000
	$180,000

PHASE III (1986-1989)

Establishment of a regional demonstration-training centre is the goal of Phase III. This centre will be used for systematic and continuous training of medical physicists, medical doctors and medical engineers in the fields of nuclear medicine, radiation therapy and radiopharmaceuticals.

The required equiment is listed below:

Linac	$1,500,000
γ-camera	200,000
CT	900,000
Line for preparation of radioimmunoassay kits	150,000
Line for preparation of radiopharmaceuticals	100,000
	$2,950,000

Careful assessment of the centre should be made in terms of benefits, financial resources, location, maintenance capability and timing. A study mission planned by the Government of Japan to visit RCA countries in 1983 will provide useful information for this assessment. The experience gained in CRPs and training programmes should be reflected in the assessment. An experts team should be sent by IAEA to make a final assessment and to establish a project plan in 1986.

Experts mission for assessment and planning $ 16,000
4 experts, 3 weeks
(1986)

SUB-PROJECT 1: RADIATION THERAPY FOR CANCER

	1982	1983	1984	1985	1986	1987	1988	1989	Project Cost($)
PHASE I									
1. CRP on improvement of radiation therapy	[		1						250,000
2. Training workshop on radiation therapy in cancer (JICA)		[2]							80,000 (JICA)
PHASE II									
3. Training workshops on radiation treatment of cancer of the uterus			[3]		[3]				160,000
4. Training courses on CT and Linac using existing facilities				[4]		[4]			160,000
5. Fellowships for 10 months training, 4 trainees per year					5				160,000
TOTAL									810,000

SUB-PROJECT 2: NUCLEAR MEDICINE FOR LIVER AND THYROID DISEASES

	1982	1983	1984	1985	1986	1987	1988	1989	Project Cost ($)
PHASE I									
1. CRP on nuclear medicine		1							130,000
2. Training workshop on nuclear medicine (JICA)			2						80,000 (JICA)
PHASE II									
3. Training courses on nuclear medicine for liver and thyroid diseases			3	3	3	3			360,000
4. Fellowships for 10 months training 4 trainees per year					4				160,000
TOTAL									730,000

SUB-PROJECT 3: NUCLEAR TECHNIQUES FOR TROPICAL PARASITIC DISEASES

	1982	1983	1984	1985	1986	1987	1988	1989	Project Cost ($)
PHASE I									
1. CRP on diagnosis of parasitic diseases		1							71,000
PHASE II									
2. Training courses on diagnosis of parasitic diseases				2	2				70,000
TOTAL									141,000

SUB-PROJECT 4: PREPARATION OF RADIOPHARMACEUTICALS

	1982	1983	1984	1985	1986	1987	1988	1989	Project Cost ($)
PHASE I									
1. CRP on the development of Tc-99m generator systems			1						170,000
PHASE II									
2. Training courses on the preparation of radiopharmaceuticals				2		2			120,000
3. Training courses on the preparation of radio-immunoassay kits			1		1	1			180,000
TOTAL									470,000

INTERNATIONAL ATOMIC ENERGY AGENCY
AGENCE INTERNATIONALE DE L'ENERGIE ATOMIQUE
МЕЖДУНАРОДНОЕ АГЕНТСТВО ПО АТОМНОЙ ЭНЕРГИИ
ORGANISMO INTERNACIONAL DE ENERGIA ATOMICA

WAGRAMERSTRASSE 5, P.O. BOX 100, A-1400 VIENNA, AUSTRIA, TELEX: 1-12645, CABLE: INATOM VIENNA, TELEPHONE: 2360

IN REPLY PLEASE REFER TO:
PRIERE DE RAPPELER LA REFERENCE:

7th January 1983

Dear Dr. Ramanna,

Following your visit to the Agency, on 9 December 1982, my Department has considered several possible approaches on how to utilize the funds offered by the Indian Government in support of the RCA activities, in an optimal manner.

Several ideas have been developed, and I would like to present three, asking for your comments and opinions.

1. Computers in nuclear sciences

Attached is a proposal for a regional project which will be submitted for consideration by the Technical Cooperation Programmes Division, and is proposed for Africa. It seems to me, however, that a scheme as proposed here, might be of considerable value also to the RCA countries. The proposal has some interesting merits.

- it benefits all branches of science,
- it can be easily modified for RCA by limiting it to the "use of microprocessors and desk computers in research reactor-oriented studies",
- if the Indian scientists would contribute to the development of the specific methodology for such training, part of the donated funds could be used to promote this work.

2. Fission studies and neutron scattering research

Such a project would be oriented mainly towards basic studies in nuclear and solid state physics, and in radiochemistry. The first step in its implementation would be an extended workshop, where the promising

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Dr. R. Ramanna
Director
Bhabha Atomic Research Centre
Trombay, Bombay 400 085
INDIA

topics would be investigated, and the strategy for further cooperation would be elaborated upon. Subject to the outcome of the workshop (which should be mainly technically oriented) several ways of future cooperation can be envisaged:

(i) Organization of a common project, to be executed in one of the research reactor centres. To start with, a simple problem should be selected, the scientists from the region should come together, form a team and work together, for a period not shorter than three months, preferably six. A paper should be one of the results of this cooperation and should be published. The Agency could contribute to this by the appointment of a short-term high level expert.

(ii) If the topic requires it, a team of scientists from the region could be organized to propose and implement a project at a high-flux research reactor.

(iii) The assistance to individual projects can be offered in view of personnel exchange, and appointment of short-term preferably Indian scientists to other research reactor laboratories in the region.

It should be convened in BARC because a good library with up-to-date numbers of different journals will be needed, and should be scheduled for 14 days.

3. Development of Tc-99m generators using low power research reactors

The objective of the project is to develop an appropriate technology for the production of Tc-99m generator systems capable of being used with low specific activity of inexpensive natural MoO_3 (30 - 100mCi/g) produced in nuclear research reactors of relatively low thermal neutron fluxes ($\geq 5 \times 10^{12}$ n/Sec. cm^2) and to test the routine performance of the developed generator, (a sublimation or solvent extraction generator) in the environment of a radiopharmaceutical unit of a nuclear medicine service either in a hospital or nuclear research centre.

Few of the most immediate benefits to RCA countries that can be expected from the project are:

- better utilization of the available research reactors of the region for the production of radioisotopes, in particular of Mo-99,

- greater local availability in remote centres of Tc-99m for use in diagnostic nuclear medicine studies.

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To start setting these ideas in motion, an initial coordination meeting and a workshop should be convened in BARC with a duration of two weeks. The meeting would be attended by senior scientists from nuclear research centres of the area involved in the production of radioisotopes who at the same time, if possible, should also be responsible for the respective research contracts in the frame work of this project. The meeting will review and discuss the technical and economical aspects of the available options (sublimation and solvent extraction) and will assess their potential and significance in the origin.

The workshop is intended to familiarize the participants in a series of lectures and exercises with the technical details of the radionuclide generator systems.

In the meantime, we have received a telex from Dr. Iya proposing a 2 week workshop in BARC on production of Tc-99m generators. This proposal is consistent with our idea, so that we will arrange the workshop in consultation with Dr. Iya. The workshop will provide the opportunity for training and initial coordination for Regional Cooperative Project.

Your comments on the above proposals including the selection of project and allocation of funds will be very much appreciated. The Agency's technical staff would like to start the implementation of India's supported RCA project as soon as possible.

Kindest personal regards Yours sincerely,

M. Zifferero
Deputy Director General
Head of the Department
of Research and Isotopes

Attachment

I. Circumstances

IAEA symposium "Prospective Methods of Radiation Therapy in Developing Countries", Kyoto, 1981
Project Proposal "Medical and Biological Application of Nuclear Techniques", Vienna, 1982
Research Coordination Program under RCA "Improvement of Conventional Radiation Therapy in Asian Countries by theApplication of Radiobiological Findings", 1983

JICA Workshop "Medical and Biological Application of Radiation and Isotopes", Tokyo, 1981
(1) Radiobiology & Bionucleonics
(2) Radiation Therapy
(3) Nuclear Medicine
(4) Radiation Health Safety (incl. environmental radiation science, health physics, etc.)

II. Radiation Therapy

Research Coordination Program:
combination of radiation with other modalities (e.g., hyperthermia)
Training Program:
high dose rate schedule with After-Loading System

III. Nuclear Medicine

Research Coordination Program:
optimization of in vivo nuclear-medical practice in the diagnosis of liver and thyroid diseases

IV. Demonstration Center of Radiological Techniques

INFORMATION ON GROUP TRAINING COURSE IN MEDICAL AND BIOLOGICAL APPLICATION OF RADIATION AND RADIOISOTOPES

STUDY MEETING ON RADIATION THERAPY AND RELATED SUBJECTS

1983—84

THE GOVERNMENT OF JAPAN

INFORMATION ON GROUP TRAINING COURSE IN MEDICAL AND BIOLOGICAL APPLICATION OF RADIATION AND RADIOISOTOPES STUDY MEETING ON RADIATION THERAPY AND RELATED SUBJECTS IN 1983 - 84 BY THE GOVERNMENT OF JAPAN

I. Introduction

The Group Training Course in Medical and Biological Application of Radiation and Radioisotopes, subtitled Study Meeting on Radiation Therapy and Related Subjects in fiscal 1983 (April 1, 1983 - March 31, 1984) will be conducted by the Government of Japan as part of its Technical Cooperation Programmes for developing countries with a view to contributing to upgrading their knowledge and techniques in this field and to thus promoting friendly relations between them and Japan.

Arrangements for conducting the course are administered by the Japan International Cooperation Agency (hereinafter referred to as JICA), commissioned by the government of Japan to execute technical cooperation programmes in collaboration with related organizations in accordance with the Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology of the International Atomic Energy Agency (IAEA). This is the 2nd Study Meeting of the series which is organized based on the recommendation by the workshop meeting titled "Medical and Biological Application of Radiation and Radioisotopes" held in Tokyo in 1981.

II. Purpose

The purpose of this course is to transfer the latest techniques available in Japan in the treatment of cancers of the head and neck and the uterine cervix, to the participants from developing countries through lectures, practices, discussions and study tours. The particular emphasis of the present course will be placed on the combined therapy with radiation and surgery for head and neck cancers and on the effectiveness of high dose rate remote afterloading system for uterine cervix cancer.

III. Programme

The provisional programme of the course is given in the Appendix.

IV. Qualification of Applicants

Applicants are to:

(1) be nominated by their government in accordance with the procedures mentioned in VIII (1) below,

(2) be licensed physicians authorized by their governments,

(3) be under about forty five (45) years of age,

(4) have occupational experience of more than several years in radiation treatment,

(5) be engaged in the same field after return to their countries,

(6) have a sufficient command of spoken and written English, and

(7) be in good health, both physically and mentally, to undergo the course of training. Pregnancy is regarded as a disqualifying condition for the participation in the course.

V. Duration

From August 11, 1983 to September 25, 1983.

VI. Language

The course will be conducted in English or through the interpretation of Japanese into English.

VII. Facilities and Institutions

(1) National Institute of Radiological Sciences
9-1, Anagawa 4-chome, Chiba-shi, 260 JAPAN

(2) National Cancer Center Hospital
1-1, Tsukiji 5-chome, Chuo-ku, Tokyo, 104 JAPAN

(3) Tokyo Metropolitan Komagome Hospital
18-22, Honkomagome 3-chome, Bunkyo-ku, Tokyo,
113 JAPAN

(4) Cancer Institute Hospital
37-1, Kamiikebukuro 1-chome, Toshima-ku, Tokyo,
170 JAPAN

(5) Hokkaido University Hospital
Kita 14, Nishi 5, Kita-ku, Sapporo, 060 JAPAN

(6) Nuclear Safety Research Association
2-2, Uchisaiwai-cho 2-chome, Chiyoda-ku, Tokyo
100 JAPAN

VIII. Procedures and Application

(1) The government desiring to nominate applicants for the course should fill in and forward five (5) copies of the Nomination Form (Form A2-3) for each applicant to the Government of Japan through the embassy of Japan not later than June 17, 1983.

(2) Applicants should affix a copy of their historical record of occupational radiation exposure with the Nomination Form, in order to facilitate the radiation safety control at the training site.

(3) The Government of Japan will inform the applying government whether or not the nominee is acceptable to the course by July 11, 1983.

IX. Status Report

Participants are requested to present a short report of about 10 minutes length on their interested subjects in radiation treatment as well as their comments on this course. Submission of the written version of this report including figures and tables is desirable at the beginning of the course.

X. Allowance and Expenses to be borne by the Government of Japan in accordance with JICA rules and regulations

(1) Economy-class round trip air-ticket between the international airport designated by JICA and Tokyo

(2) An allowance of ¥3,800 per diem and other allowance for outfit, book and literature-transport charges in addition to free accommodation and breakfast at JICA Training Centres

(3) Free medical care for participants who become ill after their arrival in Japan

(4) Expenses for JICA study tours

XI. Accommodation

Tokyo International Centre (TIC) will be available for participants studying in and around Tokyo.

In case no room is available at a JICA Training Centre, JICA will arrange accommodations for participants at other appropriate places.

Tokyo International Centre, JICA
No. 42-11, Honmura-cho, Ichigaya, Shinjuku-ku, Tokyo,
162 JAPAN
Tel. Tokyo (03) 267-3211

XII. Certificate

Participants who have successfully completed the course will be awarded a certificate by JICA.

XIII. Other Information

(1) Before leaving their country, participants should have an entry visa to Japan which will be issued by the diplomatic missions of Japan in their country.

(2) Participants are required to arrive in Japan on the date designated by the Government of Japan after confirmation of acceptance as mentioned in VIII (2) above. However, the date will be finally confirmed by the air-ticket sent to the participants.

(3) On arrival at New Tokyo International Airport at Narita, the participants are requested to follow the undermentioned arrival procedures.

i) When quarantine, immigration and customs clearance procedures have been completed, the participants should go to one of the Meeting Service Counters located in the North and South Wings of the arrival terminal.

ii) Bus tickets to the Tokyo City Air Terminal (TCAT) will be provided at the Counter and a service staff will help the participants to the airport bus terminal.

iii) Airport bus to TCAT will take approximately 90 minutes.

iv) Upon arrival at TCAT, JICA designated travel agents will meet the participants and will take them directly to one of the training centres, or if necessary, to a hotel where reservations have been made for them by JICA. (Agents will give them information on their schedule and will answer their questions.)

v) The Meeting Service Counter will close at 10 p.m. In case the participants arrive after 10 p.m., they should go to the Arrival Information Counter of Japan Air Lines (JAL) in the North Wing Terminal or the Arrival Lobby. JAL attendants will direct them to the TCAT airport bus. At TCAT, a travel agent will be waiting for them.

Necessary care of the participants, thereafter, will be taken by JICA throughout the duration of the course.

(4) Participants are required to observe strictly the course schedule.

(5) Applications to change the training subjects or extend the training period will not be accepted.

(6) In order to carry out the course in a group, participants are strongly requested not to bring any member of their family.

(7) For administrative uses, participants are requested to bring five (5) copies of their photograph (passport size).

(8) Participants are requested to follow the return trip schedule designated by JICA.

(9) The mean temperatures and humidity in Tokyo are as given below. Participants should prepare accordingly.

Month	T max.	T mean	T min.	H (%)
August	31.0°C	26.7°C	23.5°C	77
September	27.0	23.0	19.0	77

(10) Further information concerning the course is available at the following address:

Japan International Cooperation Agency
(Second Training Division
Training Affairs Department)
P.O. Box 216, Shinjuku Mitsui Bldg.,
2-1, Nishi-shinjuku, Shinjuku-ku,
Tokyo 160, Japan
Tel.: Tokyo (03) 346-5143
Cable Address: JICAHDQ TOKYO
Telex: J22271

Appendix

Provisional Programme

Aug. 11 (Thu)	Arrival in Japan
Aug. 12 (Fri)	Briefing (General guidance by JICA)
Aug. 13 (Sat)	No official schedule
Aug. 14 (Sun)	No official schedule
Aug. 15 (Mon) through Aug. 19 (Fri)	Orientation and instruction by JICA This programme will be prepared by JICA regarding study plan, general information, everyday life in Japan, etc.
Aug. 20 (Sat)	No official schedule
Aug. 21 (Sun)	No official schedule
Aug. 22 (Mon)	
Morning	Opening lecture Toyozo Terasima (NIRS) Orientation for clinical training and introduction to schedule
Afternoon	Lecture 1: Epidemiology Takeshi Hirayama (NCC Research Institute) Lecture 2: Radiation Oncology in Japan Yasushi Shigematsu (Osaka University)
Aug. 23 (Tue)	Clinical study and training#
Aug. 24 (Wed)	"
Aug. 25 (Thu)	"
Aug. 26 (Fri)	
Morning	Lecture 3: Radiation therapy of carcinoma of the uterine cervix Tatsuo Arai (NIRS) Lecture 4: Management of the Radiation therapy facilities Akira Kurisu (NIRS)
Afternoon	Study tour I: The National Institute of Radiological Sciences (NIRS)

Aug. 27 (Sat)	No official schedule
Aug. 28 (Sun)	No official schedule
Aug. 29 (Mon)	
Morning	Lecture 5: Radiation treatment planning Atsuo Akanuma (The University of Tokyo) Lecture 6: Radiation biology I. (in vitro) Hiromichi Matsudaira (NIRS) Lecture 7: Radiation biology II. (in vivo) Kiyohiko Sakamoto (Tohoku University)
Afternoon	Presentation of the status reports by participants and Discussion
Aug. 30 (Tue)	Clinical study and training#
Aug. 31 (Wed)	"
Sep. 1 (Thu)	"
Evening	Move from Tokyo to Kyoto
Sep. 2 (Fri)	
Morning	Study tour II: Kyoto University Hospital
Afternoon	Lecture 8: Intraoperative irradiation and hyperthermia in cancer therapy Mitsuyuki Abe (Kyoto University)
Evening	Move from Kyoto to Hiroshima
Sep. 3 (Sat)	
Morning	Study tour III: Research Institute for Nuclear Medicine & Biology, Hiroshima University
Afternoon	
Evening	Move from Hiroshima to Tokyo
Sep. 4 (Sun)	No official schedule
Sep. 5 (Mon)	
Morning	Lecture 9: Head and Neck Cancer I: Radiation Therapy Junichi Horiuchi (Tokyo Medical and Dental College) Lecture 10: Head and Neck Cancer II: Combined treatment of radiation and surgery Masaoki Uchida (Cancer Institute Hospital)
Afternoon	Lecture 11: Conformation radiotherapy Tadayoshi Matsuda (Tokyo Metropolitan Komagome Hospital) Lecture 12: Particle radiotherapy Hiroshi Tsunemoto (NIRS)

Sep. 6 (Tue)	Clinical study and training#
Sep. 7 (Wed)	"
Sep. 8 (Thu)	Clinical study and training#
Sep. 9 (Fri)	Study tour IV: Nippon Electric Company (NEC) (Abiko)
Sep. 10 (Sat)	No official schedule
Sep. 11 (Sun)	No official schedule
Sep. 12 (Mon)	Clinical study and training#
Sep. 13 (Tue)	"
Sep. 14 (Wed)	"
Sep. 15 (Thu)	No official schedule (Nat. Holiday of Japan)
Sep. 16 (Fri)	
Morning	Lecture 13: Method for Statistical analysis of clinical results Suketami Tominaga (Aichi Cancer Center) Lecture 14: ICRP concept for medical exposure Takashi Maruyama (NIRS)
Afternoon	Lecture 15: Diagnosis I: Fiberscopy for cancer treatment Shigeto Ikeda (NCC Hospital) Lecture 16: Diagnosis II: X-ray diagnosis of the early gastric cancer Tatsuya Yamada (NCC Hospital)
Sep. 17 (Sat)	No official schedule
Sep. 18 (Sun)	Move from Tokyo to Sapporo
Sep. 19 (Mon)	Study tour V: Hokkaido University Clinical study and training of synthetic radiation therapy system at university hospital
Sep. 20 (Tue)	
Sep. 21 (Wed)	Move from Sapporo to Tokyo
Sep. 22 (Thu)	
Morning	Evaluation Meeting
Afternoon	Closing Ceremony
Sep. 23 (Fri)	Preparation for departure (Nat. Holiday of Japan)

Sep. 24 (Sat) Preparation for departure

Sep. 25 (Sun) Leave Japan

#: Hospitals and Institutes for Clinical study and training

(1) National Institute of Radiological Sciences (NIRS)

(2) National Cancer Center (NCC) Hospital

(3) Tokyo Metropolitan Komagome Hospital

(4) Cancer Institute Hospital

Proposal for a Three-week Workshop on the Use of Microprocessors in Research Reactor Utilization

The successful role of experimental programmes based on the use of low and medium flux research reactors in triggering the generation, development and acquisition of capabilities in nuclear techniques has been well recognised. In most developing countries expertise grown and generated through such means has formed the nucleus of the technical and manpower infrastructure for large nuclear programmes later. It is, therefore, appropriate that a similar approach is made in relation to the adoption and assimilation of the fast developments that have taken place in recent years in electronic information acquisition and processing.

The use of microprocessors and minicomputers for experiments in the nuclear sciences provides a particularly appropriate means of the adoption of those developments. Wholesale adoption of commercially available systems is not always useful and has its pitfalls of overdesign, underoptimisation, high cost etc. With this in view it is proposed that a three-week workshop be organised in Bhabha Atomic Research Centre for the benefit of member states of RCA to highlight the appropriate use of microprocessor based technology for Instrument Control, Data acquisition and Processing.

The course will provide an opportunity for the participants to go through the process of defining a mission, identifying an

appropriate philosophy, choosing a proper microprocessor/mini-computer system and then following it up with details of system design, choice of hardware and software development. The participants will be given lectures and practical demonstrations on different possible systems and taken through the process of selecting the proper hardware. The examples taken will be a neutron spectrometer, an x-ray flourescence elemental analysis system or similar nuclear equipment.

The workshop will bring home to the participants the need for proper balancing of tasks to be performed and the system to be chosen. The way to achieve economical and optimal designs and the importance of software development specially suited for the task will be brought out.

It is proposed that the course be conducted at BARC for three weeks in October or November, 1983. About ten participants from the RCA member states can be accommodated. The lectures and experts required for the Workshop will be drawn from various Division of BARC. The equipment required for the Workshop are also available in BARC. The expenditure on this Workshop can come from India's contribution to RCA for this year.

Proposed Programme of Workshop

1.	Introduction to computer based data acquisition, on-line analysis, control of Physics Experiments	2 lectures (Nuclear Physics Division)
2.	Computer architecture:	6 lectures
	CPU, memory, I/O Peripherals storage devices)	(Nuclear Physics Division) (Computer Section)
3.	Programming the Micros:	6 lectures
	Operating system, Languages Programming aids Application programmes	(Nuclear Physics Division) (Computer Section)
4.	Design of Computer based Systems:	3 lectures
	A/D, D/A converters, Communication interfaces, CAMAC	(Nuclear Physics Division) (Electronics Division)
5.	Case Studies	5 lectures
	1) Multichannel analysis	(Nuclear Physics Division)
	2) Multiparameter data acquisition	(Computer Section)
	3) Control of experiments and on-line data processing	
6.	Special Seminars	4 lectures (TIFR, ECIL and other external agencies)
7.	Practical Work	40 hours
	SC/MP, 8085, PDP 11/03	(Nuclear Physics Division) (Training Division)

	9.30 to 11.00	11.30 to 1.00	2.30 to 4.00
Monday	Inauguration		Practicals
Tuesday			Visit to
Wednesday			Computers
Thursday			in BARC*
Friday			
Monday			Practicals
Tuesday			Visit to
Wednesday			Electronics
Thursday			Division
Friday	Visit to TIFR**		
Monday			Practicals
Tuesday			Visit to
Wednesday			Reactor and
Thursday			Accelerator
Friday			installa-
			tions at BARC

* Bhabha Atomic Research Centre.

** Tata Institute of Fundamental Research.

PROPOSAL FOR PHASE II (TECHNOLOGY TRANSFER) OF THE ASIAN REGIONAL COOPERATIVE PROJECT ON FOOD IRRADIATION

Introduction

Food irradiation is gaining increasing recognition as a physical method of food preservation. It is considered as a broad spectrum process applicable to treatment of most varieties of food items. Certain established technologies, e.g., curing, chemical preservation and fumigation are now being evaluated with regard to their biological safety, economic feasibility and possible reduction in the market quality of products so treated. Three decades of developmental work on the preservation of food by irradiation have shown that this technology could reduce post-harvest losses of food and make more food available to mankind. Its applications include, among others, sprout inhibition of root crops; insect disinfestation of cereals, dried fish and meat, fresh fruits; shelf-life extension of fresh fruits and vegetables; improving hygienic conditions of fresh and frozen food, spices, etc.

In Asia and the Pacific, eleven Governments of Member States of the IAEA have agreed to collaborate under the scope of the Asian Regional Cooperative Project on Food Irradiation (RPFI) to evaluate the practical application of the technology in the region, for an initial period of three years, i.e., from 28 August 1980 to 27 August 1983. These countries are Bangladesh, India, Indonesia, Japan, Republic of Korea, Malaysia, Pakistan, Philippines, Sri Lanka , Thailand and Viet Nam. The Government of Japan has agreed to sponsor the activities under the RPFI for the three year duration at a total cost of US$236,000. Arrangements are now being made to extend the RPFI Project Agreement for one additional year, i.e., until 27 August 1984, without additional cost to the donor Government, to complete the tasks foreseen under the scope of the Project.

A copy each of the RPFI Project Agreement, final reports of the first and second meetings, and a draft report of the third meeting of the RPFI Project Committee are attached as Annex I.

Recent Developments in Food Irradiation

To date, some 40 items have been cleared for human consumption by national public health authorities in twenty-four countries. Some of these foods are irradiated at semi-industrial or commercial scale and distributed to markets. Significant developments on acceptance of irradiated food for human consumption at both the national and international levels have occurred in the past few years, which included, among others, the following:

1. The Codex Alimentarius Commission (CAC) of the Joint FAO/WHO Standard Programme adopted in December 1979 the Recommended International General Standard for Irradiated Food, together with the Recommended Code of Practice for the Operation of Radiation Facilities for Treatment of Food (Annex II). The Recommended Standard and Code of Practice have been circulated to all 120 member countries of the CAC for acceptance. The main purpose of the Standard and Code of Practice is to ensure good manufacturing practice for irradiated foods destined for national and international trade.

2. The major milestone on food irradiation was laid in November 1980 when the Joint FAO/IAEA/WHO Expert Committee on the Wholesomeness of Irradiated Food (JECFI) concluded that irradiation of any food commodity up to an overall average dose of 10 kiloGray (10 kGy) presents no toxicological hazard; hence toxicological testing of foods so treated is no longer required (Annex III). This conclusion has established that foods properly treated by irradiation up to an overall average dose of 10 kGy are wholesome and safe for human consumption.

3. The U.S. Food and Drug Administration (FDA) initiated an advance notice on its new policy for irradiated food in March 1981. In essence, the FDA proposed that food irradiated at doses of 1 kGy (100 krad) or less will be considered wholesome and safe for human consumption (Annex IV). The FDA is also considering the possibility of increasing the proposed dose level up to 10 kGy to conform with the conclusion of the 1980 Joint FAO/IAEA/WHO Expert Committee on the Wholesomeness of Irradiated Food.

Present Worldwide Applications

The above developments have brought food irradiation much closer to a commercial reality. After a few decades of research and development in this field, the future of food irradiation appears to be bright. Indeed, several countries have already treated food products by irradiation on varying commercial scales in the past years. The quantity of irradiated food which was sold to the public up to now is more than 150,000 tons. These products include potatoes, onions, frozen froglegs and prawns, spices, strawberries, mangoes, papaya, etc. The commercial activities on food irradiation are summarized in Annex V.

European countries have kept themselves one step ahead of most other countries in terms of commercial activities in food irradiation. A commercial irradiation facility in the Netherlands treats more than one thousand tons of frozen froglegs, shrimp and spices per year for the food industry. A commercial irradiation plant for treating potatoes, onions and garlic is now under construction at the Fucino Cooperative, near Rome, under the subsidy of the Government of Italy. An organization has been officially established in Hungary to supervise the industrial scale radiation treatment of food and agricultural products. A commercial scale irradiation facility will be constructed for this purpose in the near future. Significant amounts of food are being irradiated commercially in Belgium.

South Africa is going ahead with its plan to commercialize food irradiation. A commercial irradiator for treating fruits and vegetables has been constructed at Tzaneen-Transvaal Fruit and Vegetable Cooperative in South Africa. Two other multipurpose irradiators in Palindaba and Kempton Park are also available for processing food on a commercial basis.

In the RCA region, Japan was in 1973 the first country in the world to commercialize irradiated food on an industrial scale. The commercial potato irradiator at Shihoro, Hokkaido, has been treating potatoes, mainly for the processing industry, on an average of 15,000 tons per season (November - February). This plant will also process onions when it receives permission from health authorities in Japan. Research

activities in several developing countries in the region, e.g., Bangladesh, India, Indonesia, Republic of Korea and Thailand are being conducted at pilot scale. Under the Asian Regional Cooperative Project on Food Irradiation (RPFI), a project being sponsored by the Japanese Government under the RCA from 28 August 1980 to 27 August 1984, attempts are being made to intensify research on selected commodities with a view to commercializing them in the near future. Results obtained under the RPFI so far have shown promise on the application of irradiation for:

a. Insect disinfestation and improving hygienic quality of dried and cured fishery products,

b. Insect disinfestation and shelf-life extension of tropical fruits such as mangoes,

c. Control of sprouting of onions,

d. Improvement of hygienic quality of spices.

Further Needs

As developing Member States party to the RCA Agreement could produce large quantities of food and agricultural products, but also have a high rate of spoilage of these commodities, additional efforts should be made to reduce the losses and make more food available to the population of the region. With the probability of a wider application of food irradiation in the USA and Europe in the near future, countries in the RCA region should accelerate the efforts on commercialization of this technology. It is recognized that the selected food items being studied under the RPFI, i.e., fishery products, tropical fruits, (using mangoes as a representative), onions and spices are commodities of economic importance to the region. Technological feasibility of the use of irradiation in preserving these commodities is being established in the RCA region under the RPFI. It is realized that the work under the RPFI is being carried out either on a laboratory or a pilot scale basis. Efforts should therefore be made to expand activities and the duration of

the RPFI to ensure practical application of the technology in the region in the near future. It is foreseen that further activities under the RPFI should put emphasis on technology transfer of food irradiation to the local food industries. This could be accomplished as Phase II of the RPFI for a duration of three years, i.e., from 1984 to 1987.

Objective of Phase II of the RPFI

To evaluate commercial feasibility of irradiation treatment of fishery products (dried, cured and frozen); tropical fruits (insect disinfestation and shelf-life extension); onions (sprout inhibition) and spices (improve hygienic condition) in the RCA region. Emphasis will be placed on the transfer of the technology to the relevant food industries in the region.

Work Plan

1. To conduct pilot and/or commercial scale experiments on the commodities mentioned above.

2. To determine proper packaging, storage and transportation conditions of the treated commodities to ensure acceptance by the trade.

3. To conduct market testing and consumer acceptance studies.

4. To conduct pilot scale transportation trials from one country to another to facilitate international trade and to evaluate the quality of the products upon arrival.

5. To evaluate the economic feasibility of the food irradiation process with regard to the above mentioned commodities.

Local food industries will be invited to cooperate in the above studies.

Assistance Required

To facilitate practical application of food irradiation in the Asian and Pacific region, assistance in terms of research and development funds, training, advisory missions, major equipment such as pilot scale irradiators, etc. is required. The assistance should be provided on a cost-sharing basis between national authorities and funding agencies according to the following proposal.

	1st year	2nd year	3rd year
Pilot and semi-commercial scale research and development*	100,000	100,000	100,000
Advisory missions** (6 man/months per year)	36,000	40,000	45,000
Seminars and meetings**	50,000	55,000	60,000
Major equipment, e.g., irradiator***	500,000	550,000	600,000
Training**** (on an average of 48 man/months per year)	100,000	120,000	140,000
Total	786,000	865,000	945,000
GRAND TOTAL			2,596,000

* Proposed to be supported by the Government of Japan

** Proposed to be supported by the Asian Development Bank (ADB)

*** Expected to be provided through national funds, UNDP or bilateral assistance

**** Expected to be requested by Governments party to the RPFI under the IAEA's Technical Cooperation Programme

Duration of the Programme

The existing activities of the Asian Regional Project on Food Irradiation (RPFI) should be expanded to cover pilot/commercial scale experiments for three more years, i.e., from 28 August 1984 to 27 August 1987, according to the budget proposed above.

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

A PROPOSAL FOR
A REGIONAL FOOD IRRADIATION CENTRE

SUBMITTED BY

BANGLADESH ATOMIC ENERGY COMMISSION
DHAKA, BANGLADESH

28 FEBRUARY, 1983

A DRAFT PROPOSAL FOR A REGIONAL FOOD IRRADIATION CENTRE

Research and development works related to the preservation of foods by radiation are being continued for the last twenty years in this region. In 1980, the Joint Committee consisting of experts from IAEA, FAO and WHO has recommended for unconditional release of all food items irradiated upto a dose of 10 kGy (1 Mrad). This international acceptance of food irradiation as a safe and physical process has added momentum in the regional laboratories for scaling up the activities for introduction of this technology of food preservation for the greater benefit of the nations.

2. Food shortage is a chronic problem in the developing regional countries of Asia and the Pacific. Due to increased rate of population growth, the gap in available supply of food is always widening. In addition to increased food production, better preservation technology can alleviate the food shortage allowing more calories for the teeming millions. The technology of food preservation by radiation is well taken in most of the regional countries as a feasible techno-economic process which could be integrated in overall development of food supply. Harmonization of activities in food irradiation in the regional countries of Asia and the Pacific is indispensible for harnessing the advantage of this technology for both national and international trade. A Regional Food Irradiation Centre (RFIC) will offer training facilities to scientific, technological, administrative and commercial entrepreneurs for adoption of this new

technology in the regional countries. The RFIC will render expertise help and assistance and also serve as depository of information to all the member states.

REGIONAL ACTIVITIES:

For many years, regional countries are engaged in research work for the application of Food Irradiation in national scale. A Regional Co-operative Agreement (RCA) for Research, Development and Training related to Nuclear Science and Technology between the IAEA and the Member States came into force from 7 June, 1972. Under the overall programme of RCA, a decision was taken to launch an Asian Regional Project on Radiation Preservation of Fish and Fishery Products (RPF) in an expert panel meeting at Trombay, Bombay, India in 1972. RPF came into force from January, 1974 for five years. Agency also proposed for a regional project in Radiation Preservation of Dried Fish Indigenous to Asia (RPDF). To make the project more wide for covering other food items i.e. Onions, Mangoes, Spices etc. in addition to fish and fishery products, the current project was named Asian Regional Co-operative Project on Food Irradiation (RPFI).

Under the regional projects considerable advancement has been made in the field of food irradiation. During this period new-regional countries like Sri Lanka and Malaysia have undertaken food irradiation studies. Vietnam has also shown keen interest to participate in this programme. Most of the countries are now ready to use the laboratory findings for commercial/ industrial exploitation. Semi-Pilot Scale Studies of irradiated dried fish, potatoes and onions are being conducted in Bangladesh, India, Indonesia and

the Philippines. Transportation studies are being conducted in India. Philippines has already released some food items like potatoes and garlic for public consumption. Future collaborative plans include packaging studies, transshipment of irradiated foods between the participating countries and economic feasibility studies on selected food items. Another most important area which needs due consideration for successful implementation of irradiation technology is the creation of awareness amongst manufacturers, traders and consumers. Consumer's acceptability studies are being continued in many regional countries in a limited scale. National mass media like TV, Radio and Newspapers are also to some extent being utilized to propagate and educate the end-users for the benefits of this technology.

ACTIVITIES IN BANGLADESH:

Bangladesh is one of the countries in the region which started working on food irradiation in early sixties. Research activities encompassed a good number of food items as potential candidate for preservation by irradiation i.e. grains, tubers and bulbs, fish and fishery products and tropical fruits. Intensive studies are being carried out for immediate application of preservation of potatoes, onions, dried fish and some grains in co-operation with commercial channel. Semi-commercial scale studies are being continued to establish techno-economic feasibility and at the same time to educate the traders for the prospect of this new technology in Bangladesh. Packaging studies are also being done to develop a suitable packaging material for checking reinfestation in disinfestated dried fish and agricultural products. A National Seminar was held in December, 1982

which was participated by large number of Government officials, research workers, representatives of national mass media, the private entrepreneurs and also IAEA and other foreign experts. It was well covered by the national dailies, radio and television.

A country with chronic deficit of food, the top most priority of the policy makers is to attain selfsufficiency in this basic necessity. The wastage of food is very high. Therefore, every effort is being made to alleviate the food loss by the adoption of available scientific means. As radiation has shown a possible means for application in Bangladesh, activities have been geared up for sooner application of radiation technique for preservation of fresh foods and disinfestation of dried fishery and agricultural products.

JUSTIFICATION:

It has been fully recognized that introduction of food irradiation in the regional countries of Asia and the Pacific is very useful and beneficial. Regional activities of last 8 years have shown the prospect for further co-operation between the regional RCA member countries in the field of food irradiation. A regional centre for food irradiation can perform the job of —

i) Co-ordinating the bilateral or multilateral research activities in the regional RCA states.

ii) Facilitating the transportation studies between the RCA states.

iii) Co-ordinating the regional release of irradiated foods.

iv) Providing a forum for regional meetings and seminars for speedy dissemination of ideas in food irradiation to scientists, administrators and other Government officials.

v) Rendering training facilities for regional scientists and entrepreneurs engaged in food research, development and trade.

vi) Conducting cost-economics studies of some irradiated food items.

vii) Creating awareness amongst traders, industrialists and other private entrepreneurs for benefits of this technology and

viii) Providing and arranging for having the technical know-how to private entrepreneurs and government sectors interested in undertaking such venture for commercial exploitation.

To fulfill all the above-mentioned objectives, a RCA centre will be highly desirable for the speedy implementation of food irradiation technology in this region. Besides, for running the commercial irradiation plants a regular supply of trained manpower will be indispensible. A centre in the region for this purpose will be most beneficial to member states.

Bangladesh having one of the largest groups of scientists working in the field of food irradiation in the region, can offer its facilities and manpower for the development of a RCA centre. Institute of Food and Radiation Biology is a developing centre engaged in research and development of food irradiation technology in Bangladesh. When completed, IFRB will have about 240 personnel including 90 scientists. The Institute has already about 4,000 sq.meter laboratory space available. Besides, it is housed within the campus of

Atomic Energy Research Establishment (AERE) which has other Institutes i.e. Institute of Electronics and Material Science, Institute of Computer Science, Institute of Nuclear Science and Technology and an Engineering and General Service Unit. Other facilities like hostels, shopping areas, meeting places, libraries etc. are being developed. Enough space is available around the Institute for future development.

PROGRAMME OF ACTIVITIES:

The Centre will be responsible for:

1. Co-ordinating Research and development works leading to speedy implementation of the food irradiation technology.
2. Training and providing expertise help to RCA member States for food irradiation.
3. Rendering services as a Centre for information, to all establishments engaged in research, development, trade and commerce of irradiated foods.

IMPLEMENTATION OF THE PROGRAMME OF ACTIVITIES:

1) Co-ordination of Research and Development activities

Though considerable research and development has been achieved on food irradiation in the region, application in commercial scales for end users is still the greatest hurdle. Therefore, the important job of the centre will be to co-ordinate the research activities. As there is already existing a substantial amount of food trade in the regional countries, studies on the transportation of irradiated foods between member

States will be one of the areas of co-operation between countries. Trans-shipment of irradiated foods will enhance the chances of the release of irradiated food on regional basis. For transportation, packaging studies are very necessary. Such problems may be undertaken by a regional centre after pooling all available inexpensive indeginous materials in the region for developing a suitable packaging material for irradiated foods. Cost-economics of food irradiation has to be done thoroughly before advocating the Government and private entrapreneurs for undertaking the project of food irradiation as commercial venture. The proposed RFIC can provide the central facility for studies of cost-economics of food irradiation.

2) Training and Expertise help

The proposed RFIC shall organize training courses for the young scientists as well as government and private sector people for research and commercialization of irradiated foods. The programme of training will be in cooperation with IAEA and advanced states of the region. The centre will help and assist the regional states to attain self-sufficiency in trained manpower.

The centre will maintain an upto-date list of experts in the field of food irradiation. It may act as liaison for providing suitable expertise help for the requesting member states. The centre can also help in planning and construction of irradiation facilities for food preservation.

The proposed centre shall organize seminar, symposia and group visits in co-operation with the Agency and member states. Its laboratory

shall also be well-equipped for the visiting scientists of the region to work for the cross-fertilization of ideas for mutual benefits. This will also enhance understanding, co-operation and friendship amongst scientists, technologists and end users of food irradiation technology in the RCA member States.

3) Information Service

The centre shall serve as a regional depository of information on different aspects of the food irradiation technology. The regional countries may supply their experiences on operating research irradiators as well as commercial activities. Pooled regional information shall be distributed to member states in the form of bulletin, circulars or pamphlets for speedy information and perusal. Exchange of information shall also be made with IAEA, FAO, WHO and other UN bodies dealing with food.

FACILITY FOR RCA CENTRE:

1) Pilot-scale Irradiator

The Centre will have an Irradiator for demonstration, training as well as cost-economics study of irradiated foods. The strength of the source shall be around 200,000 Ci ^{60}Co/equivalent Cs^{137} with an integrated variable speed conveyor system.

2) Other Irradiation facilities

A 14 MeV neutron generator and a 3 MW research reactor are under construction at AERE, Savar. These facilities will also be available to the RFTC for experimental purposes.

3) Computer System

An IBM System 4341 computer is also being installed in the campus of AERE and will be available for use by 1983.

4) Other facilities

Variable temperature cold room units, a small irradiator of about 25,000 Curie ^{60}Co (existing strength), Model Gamma-beam-650 of Atomic Energy Canada Ltd., different types of spectrophotometers, gas chromatographs, laminar flow bench and other equipment for dosimetry and food irradiation studies are already available at the Institute of Food and Radiation Biology (IFRB), AERE, Savar.

5) Laboratory Space

About 4,000 sq. meter completed floor space is already available. If needed, additional construction for RCA Centre can be undertaken as enough space is available around the Institute for future expansion.

The major contribution of the member states, the Agency and other international bodies will be the procurement of a Pilot-scale Irradiator for the Centre. AERE has most of other facilities which will be made readily available to the Centre. If necessary, Bangladesh will also provide additional building when such centre is established here.

MAN-POWER:

The proposed centre will be staffed by one Project Director/Chief Advisor, a Senior Scientist/Technologist and two Secretarial Staff. The

proposed Director/Advisor will be appointed by the IAEA to act as Head of the Centre. Other staff members may be contributed by the regional countries.

The IFRB and other Institutes of AERE has all the trained scientific man-power in different disciplines of nuclear science and technology. IFRB has trained micro-biologists, entomologists, biochemists, nutritionists, food technologists and health physicists to carry out experiments as well as training courses for the regional scientists. Member States and the Agency may also depute from time to time the additional man-power if needed.

FUNDING THE CENTRE

Equipment/facility: A pilot-scale irradiator will be the major contribution from Member States/Agency. The cost of such facility including all the auxilliary facilities will be around 1 million U.S. dollar. Salary of the Director will be paid by the Agency.

PROPOSAL FOR A COMMERCIAL IRRADIATION CENTRE BY THE GOVERNMENT OF PAKISTAN

INTRODUCTION

The continuing growth of the world population, in combination with improvements in medical care and techniques, has emphasized the need for sterilization of medical products more than ever before. The classical methods of sterilization such as wet chemical, steam under pressure, dry heat and gaseous methods depend on the time of exposure, temperature, and moisture content. They are mainly batch processes and sealing up leads to difficulties.

During the last two decades, impressive advances have been reported in the application of intense radiation source for the sterilization of medical products. The advantages of Co-60 facilities and source in terms of their simplicity and ease of maintenance have resulted in complete adoption of gamma radiation for sterilization. Today, over 115 Co-60 commercial irradiators, covering 65 megarads, are in operation throughout the world. Total reliability, low cost, high volume production, are the key features of this process. There is no problem of toxic residues from Co-60 and no residual radiation. Packaging costs can be greatly reduced because the process is not hindered or limited by package form, shape or type of material. Small individually sealed packages or containers can be sterilized as easily as large cartons and the contents of any package will remain sterile indefinitely until the seal is broken.

NEED FOR A COMMERCIAL IRRADIATOR IN PAKISTAN

The demand for sterilized medical products, particularly the single-use items, is now rapidly increasing in Pakistan. Due to the poor hygienic conditions prevailing in the manufacture of such products as surgical gloves, dressings, catgut, swabs, plastic hypodermic syringes and sutures, these items are easily contaminated. Some of these materials are sterilized currently by the conventional methods which are very cumbersome and not entirely reliable. Mobile hopsitals require single-use items sterilized to 100% reliability for providing medical care in distant rural areas. It is, therefore, deeply felt that advantage should be taken of the well-established gamma radiation technology in replacing the conventional methods of sterilization. Presently the total volume of medical products to be sterilized is around 100,000 cubic feet but this value is expected to rise at a steep rate within the next few years.

TYPE OF IRRADIATOR AND COST

Considering the present volume of medical products, we believe that a facility with a source strength of 300,000 Ci and a maximum capacity of 500,000 Ci should be able to meet our present and projected requirements.

The current cost of a 300,000 Ci source is around $300,000 and it is about the same for the conveyor system, source-pass mechanism and related equipment. The approximate cost broken up into foreign and local components is as follows:

Cost of source (300,000 Ci)	$300,000 (foreign exchange)
Cost of conveyor and other related equipment and replenishment	$300,000 (foreign exchange)
Building and biological shield	Rs 9,000,000 (lcoal currency)
	TOTAL Rs15,000,000

MANPOWER

For the facility operating 8000 hours/year, on a three-shift basis, the following manpower will be required.

For each shift - 1 supervisor, 1 technician

Total manpower for all three shifts

Supervisors - 3 + 2 = 5

Technicians - 6 + 9 = 15

OTHER USES OF IRRADIATION

Although still in the experimental stages, there is great potential for the use of irradiation sterilization to extend the shelf-life of agricultural products such as potatoes, onions, grains and grain products. This treatment is particularly useful for dried fruits while exporting these to distant markets. Some of these activities will be done on an experimental basis.

rdening of cheap wood by polymerizing suitable monomers in situ by gamma radiation has also produced encouraging results. These experiments have been conducted in our laboratories using a small Co-60 source to produce wood-composites.

Besides the above, the Centre will cater to scientific needs of research and development in allied fields in radiation chemistry. This will necessitate a lab of medium size, comprising 10 to 20 scientists.

COUNTRY STATEMENTS ON RCA ACTIVITIES

IAEA RCA 5TH WORKING GROUP MEETING

Country Statement on RCA

Australian Statement

This year marks the sixth year of Australia's active participation in the RCA. It also marks the transference of Australia's major contribution from the Isotope Hydrology Sub-Project to a new project on "On-Stream Analysis and Control of Mineral Concentrators".

Over a five year period the Australian Government will contribute the sum of $A655,000 to the new project. The first cash contribution to the IAEA has been provided and Australian experts have made several visits to the Philippines to formulate detailed implementation plans. I look forward to seeing representatives from Participating States at the first training course in Australia scheduled for September of this year.

As announced previously, Australia's contribution to the minerals sub-project constitutes the total direct financial contribution to the RCA by Australia over the next five years. Australia will however consider carefully and sympathetically requests for assistance in kind.

Australia's active involvement in the Isotope Hydrology and Minerals sub-projects is tangible proof of Australia's commitment to the Agency's Technical Assistance Program and the RCA. Australia's involvement in the RCA has not been limited to these two projects, for example AAEC scientists have participated in Coordinated Research Programs on Radiation Sterilization of Medical Supplies suited to the local conditions for RCA countries and on the Development of Tc-99m Generators Using Lower Power Research Reactors: the AAEC hosted the 6th meeting of the Non Destructive Testing Working Group in March 1983. The Australian Radiation Laboratory has offered the use of its calibration facilities as a contribution to the project on Improvement of Cancer Therapy in Aisan Countries. Any further commitments to specific projects will however need to take into account the outcome of a review of Australia's aid program currently being undertaken by the Australian Government.

IAEA 5TH WORKING GROUP MEETING

SESSION V COUNTRY STATEMENTS OF RCA PROJECTS

Project 13: Isotope Hydrology and Sedementology Progress Report

Introduction

In the report to the 4th RCA Working Group Meeting a summary was given of the aims of the project and the status of its implementation. It was pointed out that an important measure of success of the project would be the extent to which it led to self-sustaining activities responsive to local needs. The direct Australian financial contribution will cease in 1983 although continuing support for isotope hydrology within the region through the normal Agency channels has been foreshadowed. Longer term national programs were discussed at a project review meeting held at the AAEC Research Establishment, Lucas Heights in November 1982. It therefore seems an appropriate time to examine the extent to which the input of expertise and material resources through the RCA is leading to the development of national programs. Four separate aspects will be considered:

(i) equipment

(ii) training

(iii) national initiatives

(iv) the need for the future.

Equipment

Most of the equipment budget has been used to provide environmental tritium enrichment facilities. Units have either been installed in, or committed to the Republic of Korea, Indonesia, Malaysia, Thailand and Sri Lanka. Emphasis has been placed on the provision of these facilities for the following reasons:

(i) Broad surveys of environmental tritium can be used to obtain information on the mechanism of groundwater recharge and to form a basis for planning a systematic monitoring program. An indication of distribution of 'young' groundwater is an important factor in environmental impact studies.

(ii) Tritium facilities traditionally form the nucleus of isotope hydrology and sedimentology laboratories; they can be used to support an environmental monitoring program associated with nuclear reactor installations.

Equipment for carbon-14 assays has been provided to Indonesia and other countries have expressed serious interest in these capabilities. In some cases, isotope hydrologists are examining the possibility in collaborating with archeological laboratories in obtaining carbon-14 data. Ultimately, access to precision isotope ratio mass-spectrometry will be essential.

The IAEA is organising a regular inter-laboratory comparison to support the tritium laboratories.

Training

The AAEC has accepted scientists from the Republic of Korea, Indonesia, Malaysia, Sri Lanka, Thailand and the Philippines for training in its Isotope Hydrology laboratory under the RCA on the regular Agency fellowship scheme. The Korean and Indonesian scientists are now operating laboratories; the others will be assuming a similar role when their laboratories are established.

New Initiatives

A number of major projects have been established as a result of discussion between scientists from the national authorities, the IAEA and the AAEC. These include studies of:

(i) the isotope hydrology of the Han R Valley (Korea), the Kelantan Basin and Kedeh Perlis region (Malaysia), the Bangkok Basin (Thailand), the Jakarta Basin (Indonesia) and the dry areas of Sri Lanka; and

(ii) the sedimentology (using the ^{137}Cs technique) of the Songkhla Lake (Thailand), the Sg Lui Catchment (Malaysia) and in the highland catchment areas of Sri Lanka.

At this stage of the project great importance is being placed on initiatives being taken by the national laboratories as it is these initiatives that will form the basis of an ongoing program. Examples of investigations which have already commenced include:

- the groundwater hydrology of the Kedah Perlis region (Malaysia)
- the monitoring of the tritium concentrations in the air soil crop and water resources in the vicinity of the KORI and WOLSUNG nuclear power plants (Republic of Korea)
- sediment redistribution in the highland region of Sri Lanka using caesium-137 techniques.

Proposals have been received from Thailand to extend the Bangkok groundwater study to the whole of the hydraulic basin and from Indonesia to undertake a groundwater study of the Semarang area of central Java.

Future

A self-sustaining national effort can only be maintained if working hydrologists and agriculturalists are convinced that the isotope techniques can be of value to them. Isotope hydrological techniques are well suited to defining the gross features of groundwater flow patterns on which hydraulic models and

ultimately water resource management models are based; isotope sedimentology techniques are used to assess the cumulative effects of erosion and sediment redistribution in past time, and to correlate the parameters with historical records of land use change and development. In both cases close collaboration is required with experts in a wide variety of fields. In the last analysis, the success of national projects will depend on the effectiveness with which contact is maintained with the Agency and other isotope laboratories, and with which collaboration is established with other national and international agencies and appropriate private companies.

IAEA-RCA 5TH WORKING GROUP MEETING

SESSION 11 - PROGRESS OF UNDP INDUSTRIAL PROJECT

UNDP Project on Industrial Applications of Isotopes and Radiation Technology

On-Stream Analysis and Control of Mineral Concentrators Project

It is anticipated that a Memorandum of Understanding) (MOU) between the Philippine and Australian Governments and the IAEA establishing the basis for participation by these Governments and the IAEA in a project entitled "On Stream Analysis and Control of Mineral Concentrators, will be signed in the near future.

This project,scheduled for completion in 1986, provides training courses in Australia and in the Philippines related to the application of nucleonic techniques to mineral processing operations; the installation of a nucleonic on-stream analysis system and control equipment in a mineral concentrator in the Philippines; plant studies to improve control of this concentrator; and 'in plant' training on nucleonic techniques and control.

Two training courses of four weeks duration will be undertaken in Australia, one in 1983 and the other in 1985. The Australian School of Nuclear Technology, Lucas Heights Research Laboratories, will be the centre for the first two weeks of each course, where the Commonwealth Scientific and Industrial Organisation and the Australian Atomic Energy Commission lecturers will provide participants with a working knowledge in basic nucleonic techniques and their application to mineral processing. The third week will be spent visiting the Australian Mineral Development Laboratories, Adelaide, South Australia, and mineral concentrators, to obtain first hand experience in nucleonic systems for on-stream analysis of mineral slurries. The Julius Kruttschnitt Mineral Research Centre of the University of Queensland will be the centre for the fourth week, and will provide training in control of mineral concentrators.

The Philippines Atomic Energy Commission will provide four one-week courses relating to the application of on-stream analysis to copper mineral slurries.

The Philex Banget concentrator will be the centre for 'in plant' control studies. Each participant will obtain 'in depth' training in control over a three month period, working under the supervision of an expert from the Julius Kruttschnitt Mineral Research Centre.

FIFTH RCA WORKING GROUP MEETING

BANGLADESH — COUNTRY REPORT

Bangladesh has been participating in most of the RCA projects including UNDP Industrial Project since their inception with the aim to increase Regional co-operation in the application of Nuclear Science and Technology for economic and social development. The current status of Bangladesh activities in some of the RCA projects are summarised as follows :-

1. NON-DESTRUCTIVE TESTING(NDT)

Bangladesh Atomic Energy Commission has been providing NDT services to different industries and related organizations of the country such as oil refinery, power stations, chemical and pharmaceutical industries, fertilizer factories, etc. and to some private firms. At present the services are limited to industrial radiography and ultrasonic thickness gauging. It is planned to develop neutron radiography after the installation of the research reactor at the AERE, Savar.

A 3-week Training Course on NDT practices has been planned from 5 June, 1983 where the relevant industries in the country have been invited to participate.

2. HYDROLOGY AND SEDIMENTOLOGY

An IAEA expert visited Bangladesh for one month for organizing a programme on the study of sand and silt

movement at Chittagong and Chalna harbours by radioactive tracer technique. A programme has been drawn-up for this study and the IAEA has been requested to provide necessary technical assistance under the 1984 programme.

3. RADIATION STERILIZATION OF MEDICAL PRODUCTS

Bangladesh Atomic Energy Commission has been providing the services of sterilization of medical supplies and family planning kits with the help of the 50,000 Curie gamma irradiator of the Institute of Food and Radiation Biology, AERE, Savar. Research on microbiological and physio-chemical aspects of radiation sterilization of certain medical products and phermaceuticals is also being carried out. Promotional activities for motivation of the manufactures and users of medical products for the use of radiation sterilization of medical products has been framed and submitted to the Government for approval. A scheme for setting up of a commercial radiation sterilization plant in the near future has also been prepared.

4. HEALTH RELATED ENVIRONMENTAL RESEARCH

Bangladesh Atomic Energy Commission has been participating in the RCA project on health related environmental research since 1977. The Atomic Energy Centre, Dhaka has developed the relevant methods using PIXE and XRF. In some cases, the non-nuclear method of

Atomic Absorption Spectrophotometry (AAS) has been used for the confirmation of analytical data. The achievements to-date may be summarized as follows :-

- Systematic analytical procedures for trace element analysis in biological materials such as hair, blood, nail, serum, urine, plant materials, etc. and environmental samples like soil have been developed, using the method of PIXE.

- Analytical methods(PIXE and XRF) for trace element analysis in Liquids including water and motor oil have been developed.

- A method of internal beam PIXE for air-particulate analysis after size fractionation is now under development.

- PIXE and XRF data reduction is to be performed using minicomputers and for this purpose, a PDP-11/04 system has recently been installed for real time data analysis.

- Baseline data for trace element composition of blood, hair, nail, etc. for a population of 100 subjects have been reported and compiled.

5. NUCLEAR INSTRUMENTS MAINTENANCE:

A number of laboratories have been selected for pilot laboratory studies under this programme and notable achievements have been made in recording voltage,

temparature and relative humidity, and installation drop out relays in some of the sophisticated medical equipment. For better power conditioning, dedicated power lines and earth lines are planned to be installed at the AEC, Dhaka and the Institute of Nuclear Agriculture, Mymensingh. The last research co-ordination meeting on this project was held in Dhaka from November 29 to December 3, 1982.

The Electronics laboratory of the AEC, Dhaka is regularly conducting training seminar both for the maintenance people and the instrument users and operators. The programme of " Train the Trainers "under this project has been found to be fruitful and we suggest that more such courses may be organized by the Agency.

6. DEVELOPMENT OF SEMI-DWARF MUTANTS FOR RICE IMPROVEMENT

Some progress has already been made in the evaluation of semi-dwarf mutants in cross-breeding and providing alternate gene sources for semi-dwarfness with different plant architecture and in different genetic background. In this regard, agronomic evaluation, cytological and genetic studies and cross breeding studies have been performed in two mutants of IR8 and 4 mutants of a local variety of rice " Nizersail ". Some mutants were found to be earlier maturing by 1 to 3 weeks compared to the mother variety.

7. IMPROVEMENT OF GRAIN LEGUME PRODUCTION:

Research on the improvement of mungbean, black gram and chick-pea has been continued at the Institute of Nuclear Agriculture with regard to yield, plant architecture, cooking quality, uniform maturity, nitrogen fixation, pest and disease resistance etc. In some cases, the studies have already been continued to the M_3 generation with positive results.

8. IMPROVEMENT OF BUFFALO PRODUCTION:

Studies on the nutritional requirements of Buffalo of Bangladesh are being continued at the University of Agriculture, Mymensingh. Commonly available feed stuffs with high protein diets including feeding of urea-molasses were tried using isotopic tracer technique. Various rumen functions were also examined. Further experiments will be necessary to arrive at a conclusion on the nutritional requirements of buffalo calves under Bangladesh condition.

9. RADIATION PROCESSING:

Following the UNDP Industrial Project, a research programme on Radiation Vulcanization of Rubber Latex has been taken up at the Institute of Nuclear Science and Technology, AERE, Savar. Some 12,000 seedlings of rubber plants have been planted in an area of 5 acres of land at the AERE, Savar. The scientists of this project are

expected to participate in the natural rubber vulcanization pilot plant at CAIR, Indonesia, under the RCA/UNDP project. During that participation the group plans to manufacture gloves, latex thread, foam, rubberised coier, condoms, catheters, baloons, teats, soothers, bathing caps, football bladders, adhesives, carpet backings, castings etc. at a pilot plant scale and make the marketing studies in order to see the feasibility of making these industries in Bangladesh.

Some work on the radiation induced fibre-board plastic composite formation has already been carried out. In order to make a high resistant durable insulting board it has been decided to incorporate partex and hardboard with various polymers through radiation chemical means. The effect of dose rate on the amount of polymethyl methacrylate in hardboard and partex has been determined experimentally. At 1 Mrad radiation dose the polymerisation was found to be 80% complete.

10. FOOD IRRADIATION:

2 projects, namely " Pilot Scale studies on the irradiation of Bangladesh onions", and " Time-temparature tolerance and packaging studies of irradiated dried fish" are being carried out at the Institute of Food and Radiation Biology under the RCA Programme. Irradiation of onions at pilot scale level under different storage conditions showed that complete inhibition of sprouting

by radiation is possible if irradiated before the break of dormancy period. Late irradiation, after break of dormancy period, resulted in physiological death of the primordial buds leaving a distinct discolouration. Loss of weight due to dehydration and rotting could be significantly reduced in irradiated onions at ambient temperature as compared to the control. Results of periodical determinations of weight loss, peeling loss, spoilage, sprouting, hardness, density, inner bud development, etc. indicated that onions irradiated and spread in shelves of/elevated platforms had better keeping qualities when compared with the corresponding control samples. Organoleptic evaluation and consumers acceptability test showed better quality of irradiated bulbs.

Storage of irradiated onions below ambient temperature (55-60°F) and kept spread in shelves or in netted bags could minimize losses in weight and rot. On the basis of results obtained, about 7 tons of freshly harvested onions were procured from the growers directly and irradiated within 2-3 wks. of harvest. Both irradiated and control onions have been stored in ambient condition and at cooler temp. at 15°C in (a) net bags of 20 kg each and (b) spread in bamboo wooden racks. In ambient conditions adequate ventillation and aeration arrangement have been made. Results so far obtained

indicated a significant savings in total loss of weight and spoilage on irradiation and storage in specified conditions.

It was established that irradiated dried fish(upto 1.0 kGy) could be stored at ambient temperature($30\pm2^{\circ}C$) in Bangladesh provided that the moisture content is below 15%. In search of a packaging material available in Bangladesh to check re - infestation of the product, detailed insect penetration studies on gunny bags lined with polyethylene (GB) material, clear and white polyvinylchloride materials (1.1 mm thick) (PVC & WPVC), interwoven polypropylene material lined with kraft paper (PPK), polypropylene materials (PP) etc. were made. With the exception of PP and WPVC all other packaging materials were being punctured by the insects. Further studies were conducted on PVC (white and clear), PPK and plywood boxes for semi-commercial storage of irradiated dried fish. With the exception of PPK, all packaging materials checked the re-infestation of insects. This experiment was partly conducted in the storage house of the traders. Similar results both in the laboratory and in the commercial storage were obtained. Two species of dried fishes were tried viz. mackerel and gonia (labeo sp.) in this experiment. The percentages of losses after 9 months' storage were 47 and 29 in mackerel and gonia respectively. Organoleptic evaluation was also made.

All the consumers liked the irradiated product and were willing to buy the irradiated dried fish if available in the market. The control sample was totally unacceptable and had to be discarded. Plywood boxes proved an alternate to carton boxes for export.

Semi-commercial studies for storage and transportation are initiated in the current season. Carton boxes as desired by the exporters are used in addition to PVC materials.

Regional Co-operation Agreement

5th RCA Working Group Meeting, Dhaka, Bangladesh

May 11-16, 1983

Country Statement by India

The RCA is now in its second decade of an active life and it is a pleasure for us to be participating in the 5th Working Group meeting, particularly in our neighbouring country, Bangladesh.

It is gratifying that many of the co-ordinated research and technological activities under the RCA today have grown out of original proposals to which India was a party, but which have since acquired a great deal of sophistication and have also become more comprehensive. This shows that nuclear scientists in various disciplines who are participating in the RCA Co-ordinated Research Programmes are alive to technological developments and are adopting them with discernment, discretion and circumspection. We shall substantiate this point during this Working Group meeting.

In view of the Director General's statements that the Member States participating in RCA should also contribute towards RCA programmes and because of our own view that RCA has had handsome successes to its credit during the first decade, India has offered to contribute an equivalent U. S. $ 50,000 annually in local currency towards well-defined RCA collaborative programmes in various branches of nuclear science and technology. We are happy to report that during the financial year 1982-83, a start has been made in the use of these funds. No doubt, during the current financial year, utilisation of these funds will be much higher.

In the field of Industrial Application of Radioisotopes, India has been participating actively, besides attending a number of review meetings and training courses in areas as diverse as NDT and Radiation Processing. Participants from the Hindustan Paper Corporation Limited attended a workshop on the use of nucleonic control systems in the Paper Industry in Thailand, in April. At the Bokara Steel Plant near Calcutta, a nucleonic thickness control system for hot rolled steel

is due to be commissioned this month. Preparations are now underway for holding 2 training-cum-demonstration courses in India, one in tracer technology and one in sterilisation of medical supplies.

We have participated effectively in many RCA programmes in the Bio-medical, Food and Agricultural fields. In the programme on domestic buffalow improvement, two of our Agricultural Universities have undertaken studies, under a co-ordinated research programme, related to the endocrinal aspects of the female buffalo and hormonal levels in the male. A 6 week Workshop on Microprocessors as Applied in Nuclear Instruments was conducted in Trombay in January-February, 1983 which was attended by 10 participants.

In the field of medical and biological applications of nuclear techniques, India organised a well attended 2-Week Workshop on 99m-Tc generators at BARC, Bombay, during February, 1983. Two Research Centres are already participating in the Co-ordinated Research Programme on "Improvement of cancer therapy" and a third centre will also be joining. We would also be willing to run specialised courses as may be needed.

In general, training aspects are very important in our region in relation to radiation therapy of cancer and nuclear medicine applications. Such programmes if properly integrated into the co-ordinated research programme will be successful. Thus, topics like "After-loading techniques" in the treatment of cancer of the cervix and replacement of radium in the management of such carcinoma are relevant. Similarly, in order to develop competence in the application of Radioimmunoassay techniques in diagnostic procedures in thyroid and parasitic diseases, training programmes should be undertaken. This also applies to the training in the preparation, control and utilisation of radioimmunoassay kits. In fact, in India we regularly conduct 2 training courses every year in April and October for medical and para-medical participants.

Our country has a great interest in the radiation preservation of food and food products and has been participating in all RCA activities in this area. We would like to make available our facilities,

experiance and expertise in training in these areas.

In the field of neutron scattering and allied techniques, it is well known that RCA programmes have recorded major success and now there are a number of bilateral exchanges which have resulted from this. I would like to mention our supply of a fully automated microprocessor controlled Universal Triple Axis Neutron Spectrometer made in BARC to the Korea Advanced Energy Research Institute in Seoul recently. In this context, we should like to mention the development of the use of minicomputers and microprocessors in nuclear techniques. While wholesald purchase and adoption of commercially available systems may appear simpler and quicker, we have pursued a different philosophy. Just as nuclear science was used as a vehicle for accelerating the technological and industrial growth, we are now using the opportunity of introducing the advances in electronics to develop our own indigenous skills in generating both hardware and software. Thus for a given nuclear technique or experiment, we define the basic operations, then appropriately choose the hardware, architecture the system and suitably develop the software. Such systems will not only be easier to maintain and service, but will be a lot cheaper and also result in experiance in software development. We have adopted this approach in the spectrometer cited above and many other systems designed in our nuclear energy programmes. It is in this spirit that we have proposed a RCA project at this meeting on the use of microprocessors in research reactor utilisation.

In India, in recent years, we have been paying attention to the development and use of charged particle accelerators. In isotope production, medical applications, in material testing and in basic research in the physical and chemical sciences, accelerators are a natural corollary to nuclear reactors. A major programme in this area was the wholly indigenous construction of a 60 MeV Variable Energy Cyclotron in Calcutta. This accelerator is now being used not only by scientists in our nuclear energy laboratories but by research groups from our universities also. Acclerators of an advanced nature and of

other types like a pelletron and linear accelerators are part of our current programmes. We would be willing to consider sharing our experience in this field with our RCA partners.

We hope that the deliberations of this Working Group Meeting will lead to further consolidation of the work carried out under the RCA.

THE EMBASSY OF
THE REPUBLIC OF INDONESIA
D A C C A

5TH REGIONAL CO-OPERATIVE AGREEMENT (RCA) WORKING GROUP MEETING IN DHAKA (11 - 16 MAY 1983)

MR CHAIRMAN AND DISTINGUISHED DELEGATES,

The Indonesian Institute of Atomic Energy could not send a delegation to the 5th RCA Working Group Meeting which is being held in Dhaka from 11 - 16 May 1983, and asked the Embassy of Indonesia in Dhaka to represent in this meeting.

Upon instruction from Jakarta, I would like to inform the distinguished delegation to this meeting, the activities which is so far has been done by the Indonesian Institute of Atomic Energy and the Indonesian position in the Regional Co-operative Agreement which are as follows :

A. FOOD IRRADIATION : Indonesia will host a National Seminar on Food Irradiation in Jakarta from 6 - 8 June 1983.
Five Speakers from abroad will attend the Seminar among others: (LOAHARANU, DIEHL, FARKAS, KAWABATA and SIVINSKI).
In this Seminar Indonesia will propose the setting-up of a "Regional Agreement" to be implemented in this activities among the participants, with the intension that the limited funds of the Institute of Atomic Energy Agency could be used only for meeting expenses so that the communication between the researches from the participating countries are still continuing.

THE EMBASSY OF
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DACCA

B. Activities of sterilisation/radiation in Indonesia started to be accepted by the people with the use of irradiator owned by the Indonesian Institute of Atomic Energy and in 1981 the Institute had radiated 12 tons, while in 1982 - 26 tons.

C. Activities of Hydrology and Sedimentology, apart from the routine Sedimentology activities in various harbours and harbours which are being built and inspection of lakes/dams, activities of Ground Water Hydrology by using of natural isotopes will be implemented for the region of Jakarta, the capital of the Republic of Indonesia.

D. In the "Development of Tc - 99 m Generators" Indonesia has received One Research Contract with the International Atomic Energy Agency.

E. In the activities of "Mutation Breeding" Indonesia has been successful in getting one Mutant/High Variety which was approved by the Department of Agriculture to be distributed to the people. This High Variety was given the name ATOMITA I, and could stand against GREEN and BROWN INSECTS of BIOTIPE I, could stand against DESEASE of LEAF BACTERIA; STRIPES LEAF BACTERIA, BLAST and the production is quite high, the rice is tasty and it grows approximately 124 days.

F. RADIOGRAPHY ACTIVITIES : Indonesia proposed that IAEA could help Indonesia in conducting RADIOGRAPHY COURSES LEVEL III in 1984 in Jakarta with EXPERTS/TEACHERS and SYLLABUS in which the travel and perdiem expenses will be borne by IAEA. The courses expenses will be borne by Indonesia and type of course is local.

G. In radiation processing activities, in which Indonesia will become as "HOST INSTITUTE", the report of its status was submitted during the RCA TECHNICAL REVIEW MEETING which was held in Jakarta on 20 - 21 April 1983.
DR. MACHI (from IAEA, RCA Coordinator) knew already in details.

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H. Indonesia will participate in the RCA activities in the field of "Medical Application and Basic Research/and Radiation Chemistry in the Field of Manpower Development". /Activities.

The activities of the use of isotop in the medical field has increased every year. In 1982 increased by 55% than the previous year. Basic research by using Research Reactor for SPECTROMETRY and WATER CHEMISTRY.

THANK YOU.

Japan - Country Statement

1. Since August, 1978, when the Regional Cooperation Agreement, drawn up and negotiated by the IAEA, was concluded, the Government of Japan has attached great interest in cooperative activities of the RCA and has contributed greatly in both the technical and financial aspects of those activities.

It can be said that, the Government of Japan has made a positive contribution to expanding and accelerating the use of isotopes and radiation technology by industries in RCA countries by ways of sending experts, holding workshops and seminars, undertaking personnel training and so forth as well as financial contribution.

2. These activities are based on the policy of technical cooperation which aims at "human resources development" of member states of RCA, which we have repeatedly emphasized on may occasions such as the RCA General Conferences or Working Group meetings.

3. The Government of Japan has been participating in the Food Irradiation and RCA/UNDP Industrial Projects.

In addition, we will make as much effort as possible to support the Project on Medical and Biological Applications of Nuclear Techniques, which is expected to start this year.

In this year, after this meeting, the Government of Japan will take necessary measures to host the following programs with the close cooperation and support of various organizations concerned in Japan.

(1) Study Meeting on Radiation Therapy and Related Subjects, Tokyo, 22 August - 22 September, 1983

(2) The First RCA/UNDP Workshop on Nucleonic Control Systems for Steel Manufacture, Tokyo, October, 1983

(3) On-the-Job-Training on Nuclear Instruments Maintenance, Tokyo, November - December, 1983

The financial contribution in the fiscal year 1983 by the Government of Japan to the RCA projects will be as follows:

(1) US $30,000 for the Project on Medical and Biological Applications of Nuclear Techniques

(2) US $270,000 for RCA/UNDP Industrial Project

COUNTRY STATEMENT

REPUBLIC OF KOREA

The Republic of Korea, as a Member of RCA, will participate and support invariably all the cooperative research projects, especially the RCA/UNDP Industrial Project. The Republic of Korea believes that the RCA is an important means of accomplishing intra-regional cooperation and technology transfer of peaceful uses of atomic energy.

Regarding the RCA/UNDP Industrial Project, is is the honour and privilege of the Republic of Korea to support the training-demonstration workshop for radiation sterilization of medical products which is scheduled for two weeks during September and October of this year, both at the Bhabha Atomic Research Centre in India and the Korea Advanced Energy Research Institute of the Republic of Korea, respectively. My Government would like to reiterate the fact that the Co-60 irradiation facility with 100 kCi was installed at the Korea Advanced Energy Research Institute with the assistance of IAEA and UNDP back in 1975 and we would be very pleased if this facility could be utilized extensively for the training-demonstration workshop.

Regarding the new proposal on the medical and biological application of nuclear techniques, we want to express our welcome and willingness to take part in this project. We propose, however, the equal achievement with less funding by multiple centres which have already installed some of the facilities, instead of a single centre.

Also regarding the new proposal on Phase II of the Food Irradiation project and the project on Technetium-99m generators and core management techniqeus in small research reactors, which aims to improve radioisotope production, my Government welcomes their adequacy to the regional members and is willing to participate. On the other hand, like with other projects, we have to consider the availability of the necessary funds for the implementation of the projects.

It is also our wish to express our gratitude for the valuable contribution by the Indian Government for the research reactor utilization. My Government will be pleased to take part in the programme.

My Government wishes to offer best wishes for the opening of a Permanent UNDP Project Office in Jakarta and the appointment of a new Project Director. Thank you.

MALAYSIAN COUNTRY REPORT

THE FIFTH RCA WORKING GROUP MEETING

11th-16th MAY 1983, DACCA, BANGLADESH.

COUNTRY REPORT

M A L A Y S I A

Malaysia has always been active in the Regional Cooperative Agreement (RCA) since the early years of its inception and, throughout these past years, has continued to participate actively in and contribute to almost every project initiated under the framework of RCA. Malaysia has always considered the RCA programme as an important means for the transfer of technology to the developing countries and fully support the effort at level commensurate with the available resources.

Malaysia is now under the '4th Malaysian Plan', and as such, our national planning in the utilization of nuclear technology for the current years has to be within the framework of mission-oriented operation programmes and complementary to national development targets setforth by the '4th Malaysian Plan'.

The Government of Malaysia has formed a National Committee on RCA since the 4th RCA meeting in Kuala Lumpur, 1982. The formation of the National Committee has proved to be successful in hastening the implementation of the RCA projects in Malaysia. Through this committee broad objectives of RCA have been secured. Cooperation from appropriate local institutes, universities and private sectors both at project management and working levels have been achieved.

A report on the status of the various projects regarding their progress from that reported at the 4th Working Group Meeting in Kuala Lumpur in June 1982 follows.

I. RCA/UNDP Industrial Isotopes and Radiation Technology

1. Industrial Radiation Processing

i. Radiation Vulcanization of Natural Rubber (NR) Latex

The Rubber Research Institute of Malaysia (RRIM) is the National Coordinator for this project. RRIM will serve as the center for product evaluation and test marketing of the radiation vulcanised NR Latex in collaboration with the respective similar organizations in Sri Lanka, India and Indonesia.

Current Status of RRIM Involvement

The semi-commercial irradiation plant in Jakarta is scheduled to be commissioned in July 1983. Malaysia will be sending NR latex to Indonesia for irradiation. The irradiated latex will then be tested at the RRIM from then onwards.

UNDP has forwarded a sum of US$46,519.40 (=M$109,318.49) to RRIM in December 1982 for the purchase of the INSTRON which has been ordered through Associated Instrument Manufacture (M) Sdn. Bhd., P.O. Box 766, Kuala Lumpur 13-11. The instrument is expected to be commissioned at the RRIM Physical Testing Laboratory in June 1983.

Purchase requisitions for two testing equipments namely,

(a) two units of Wallace Multicell Ovens for ageing tests,

(b) one unit of a Hospital Steam Autoclave for sterilization tests.

have been forwarded to the Ministry of Science, Technology and the Environment of Malaysia. The Ministry is now processing the order. These equipments are expected to be available for use by June 1983.

Staff training/familiarisation

From July 1983 to December 1985, Malaysia will be sending staff to Indonesia for a total of 36 man-month (m/m) as follows:-

Year	Duration of Training	Staff
1983	July-Aug (2m/m)	RRIM
	Sept-Dec (4m/m)	RRIM
	July-Dec (6m/m)	PUSPATI
1984	Jan-June (6m/m)	RRIM
	July-Dec (6m/m)	PUSPATI
1985	Jan-June (6m/m)	RRIM
	July-Dec (6m/m)	PUSPATI

ii. Radiation Curing Surface Coating of Wood Products

A survey was made by a team of IAEA experts from October 9 to October 15, 1982 on the possibilities of radiation surface coating technologies using low energy electron beam machine (EBM) being applied in Malaysia. The team, consisting of 4 experts in relevant fields of radiation surface coating technologies using EBM, was headed by Dr. Z. Bartholome, Commissioner of Philippine Atomic Energy Commission. The other experts were Mr. H. Kamiyama of Japan Atomic Energy Research Institute (JAERI), Mr. K. Mizusawa of Nisshin High Voltage Company and Mr. K. Yoshizaki of Nippon Electrocure Company. The expert mission was particularly interested,

(a) to assess the readiness of major wood based companies in Malaysia to accept radiation surface coating technologies using low energy electron beam machine (250-350 keV).

(b) to identify conditions for the introduction of this technology for commercial practice.

Findings

Syarikat Jengka Sendirian Bhd. (SJSB) is considering to participate in the project. However, further technical studies on the production, management and maintenance of the machine and the cost of production need to be investigated and studied before any commitment is made. The company also hopes to hear further development from the mission and to follow the progress of the surface coating of wood products project in other RCA countries. One of the SJSB staff will be going to Jakarta in November-December 1983 on-the-job training on wood surface coating under UNDP/RCA Sub Project Radiation Processing Programme.

iii. Radiation Crosslinking of Polymer Insulated Electrical Wire and Cable

Unlike the first two projects mentioned above, this project is still at the preliminary stage. Malaysia is however actively participating in manpower development. Plans are afoot to send supporting staff to work and train in Jakarta as soon as the irradiation plant get underway.

iv. Radiation Sterilization of Medical Products

Malaysia has indicated her interest to participate in this project. Malaysia is always ready to send personnel to attend all relevant training courses in BARC, India and KAERI, Korea as programmed by IAEA for 1983-1985.

2. Non-Destructive Testing

The National Coordinator for this project is Standards and Industrial Research Institute of Malaysia (SIRIM).

A study on the current status of NDT in Malaysia has been carried out by SIRIM under the supervision of IAEA expert, Dr. R. Emmerich, for 3 months i.e. 18th March to 10th June 1982. SIRIM was again visited by another IAEA Technical expert for one week, 24th-29th January 1983. The purpose of the visit was to observe and study further development of the NDT programme conducted by SIRIM.

SIRIM has received the following instruments from IAEA in 1982:

1. Industrial X-Ray, 200kV; 5mA.
2. Beta-Back Scatter-Counting Thickness Measurement.
3. Boundary Zone Monitor - Radiation Survey Meter.

In 1983, SIRIM will be visited by another IAEA NDT expert for 2 months, and a mobile dark room will be presented to SIRIM by IAEA.

SIRIM will further purchase the following instruments for 1983:

1. Magnetic particle tester
2. Eddy cement crack detector

A course on NDT - Radiography and Ultrasonic, will be organised by SIRIM in July 1983.

Staff Training/Familiarisation

SIRIM will be sending personnel to attend all the NDT courses organised by IAEA in Singapore and Japan for the year 1983-1986.

3. Nucleonic Control System

Malaysia has indicated her interest and full support for all the projects under this programme. The projects are:

1. Paper Industry
2. Steel Industry
3. Mineral Exploration, Mining and Processing.

Plans have been prepared to send relevant people to attend the various training which will be organised, as programmed in the 'Project Plan for Regional UNDP Project for Asia and the Pacific (RCA)' April 1982.

The followings are the tentative training schedules for 1983-1986.

Paper Industry - The courses will be held in Siam Paper Mills, Thailand, for 3 weeks and in JAIF for 1 week.

Year	Duration of Training	Staff
1983	1m/m	Paper Industry
1984	1m/m	Paper Industry
1985	1m/m	Paper Industry
1986	1m/m	Paper Industry.

Steel Industry - The courses will be held in Bokaro Steel Mill, India for 3 weeks and in JAIF for 1 week.

Year	Duration of Training	Staff
1983	1m/m	HICOM
1984	1m/m	HICOM
1985	1m/m	HICOM
1986	1m/m	HICOM

Mineral Exploration, Mining and Processing - Will be held in AAEC for 4 weeks and PAEC for 1 week.

Year	Duration of Training	Staff
1983	2m/m	Mine Research Inst.
1984	2m/m	Mine Research Inst.
1985	2m/m	Mine Research Inst.
1986	-	-

4. Maintenance of Nuclear Instruments

PUSPATI is the National Coordinator for this project. The project has been carried out with satisfactory progress since December 1979, when it was instituted.

The reports on the progress of various activities are as follows:

i. Environmental conditions study

Continuous recording of temperature, humidity and incoming voltage supply in laboratories have been carried out, to ensure that the environmental conditions are condusive for equipments. Advices and recommendations have been given to operators and users on the proper environmental conditions.

ii. Power conditioning

50 units of simple drop-out relay and surge suppressors were built and installed at the interpacing between electronic equipment and power supply. For sensitive equipment, voltage stabilizers in conjunction with drop out relay were installed in 1982.

Seven (7) units of voltage stabilizer were received from IAEA. They are:

- Three (3) units of Gould Constant Voltage Stabilizer GT 1000.
- Two (2) units of Gould Constant Voltage Stabilizer GT 650.
- Two (2) units of Phillops Line Conditioner.

iii Corrective Maintenance

PUSPATI has extended its services in the repair of faulty equipment to near-by institutions. In 1982, services have been given to Malaysian Agricultural Research Development Institute (MARDI) and Universiti Teknologi Malaysia (UTM).

iv. Technical Assistance

An IAEA roving expert Mr. Peter Ambro was attached to PUSPATI from 12th March - 28th April 1982 and again from 7th Feb. - 27th March 1983. The purpose of his visits was to advise and assist in the formulation and implementation of maintenance plans. Multi-level of preventive maintenance and performance check-up (Level I) and overhaul (Level III) were discussed and would be implemented in stages.

v. Training Course

PUSPATI, with the cooperation of UTM, organised a course on maintenance and operation of nuclear electronic equipment for technicians. The course was held at the Physics Department from April 12th to May 7th 1982. The main aim of the course was to provide basic knowledge on the maintenance of nuclear electronic equipment as well as knowledge on detection, measurement and basic radiation protection. Seventeen (17) participants from research institutions and hospitals attended the course. Lectures were given by local lecturers.

II. Regional Cooperative Project on the Use of Nuclear Techniques in Improving Domestic Buffalo Production in Asia

Universiti Pertanian Malaysia (UPM) is the National Coordinator for this project.

The Faculty of Veterinary Medicine and Animal Science of Universiti Pertanian Malaysia has been carrying out investigation on the various aspects of reproduction of female and male and their ability to convert poor quality feed such as pressed fibre (a waste residue of the oil palm industry).

The crossbreeding of the local swamp buffalo with imported milk breed of buffalo has shown the superior qualities of the milk breeds. Semen has been successfully frozen and swamp buffaloes are being artificially inseminated at predetermined times. For this purpose, further studies are indicated to improve the fertility to artificial insemination.

One of the major constraints in buffalo reproduction is the inability of the buffalo to calve at regular intervals between calvings. This is due to the failure of the female buffalo to resume her cycle following calving. Suckling plays an important role in inhibiting ovalution. Studies have shown that short-term removal of the calf for two to three days is an effective method of overcoming this problem but much more work is needed to improve the fertility of the buffalo where this technique is adopted. Nuclear techniques have shed much light on the endocrinology of reproduction in the buffalo.

Another area of research which is in progress is to use waste residue such as palm pressed fibre for feed. The studies so far indicate that palm pressed fibre has a good potential as a source of feed for buffaloes. Buffaloes are able to maintain their body weights when fed sun-dried palm pressed fibre only as the sole feed. Further studies are in progress to improve the feeding value of palm-pressed fibre through the addition of feed supplements, ensilaging with urea and by manipulation of rumen function. Nuclear techniques are being utilised in these studies.

It is obvious that further research on reproduction and nutrition of the Malaysian buffalo is required. Additional support to continue these studies would give a significant contribution to buffalo production in the Asean countries.

III. Coordinated Research Programme on Isotope Application to Hydrology and Sedimentology

PUSPATI is the National Coordinator for this project. Other agencies collaborating in this project are the Drainage and Irrigation Department of Kelantan, the Geology Department of Universiti Kebangsaan Malaysia (UKM) and the Geological Survey Department.

The research group has carried out a considerable amount of investigation to date. The group has conducted several groundwater studies in Lower Kelantan, Kedah/Perlis and Sungai Lui, Selangor, using nuclear techniques. However, no firm conclusions can be drawn yet from the observation made and data collected. Further studies are being conducted. The results of the studies conducted in 1979-1982 and the future plan for 1983 have been discussed at the recent RCA Isotope Hydrology and Sedimentology 2nd Review Meeting 1st-5th November 1982 in Australia hosted by AAEC.

Expert Services (1982)

Under this programme Malaysia has received two expert services:-

1. Mr. B.L. Campbell of AAEC (Australian Atomic Energy Commission) visited the Sungai Lui catchment area where a pilot project on Cs-137 techniques to sediment redistribution is being studied. The progress of the study was discussed and the soil sampling technique was demonstrated.

2. Dr. B. Payne of IAEA visited PUSPATI to discuss on the overall programme of RCA Isotope Hydrology and Sedimentology Project.

Training

Mr. Roslan Md. Ali underwent training in the tritium and radiocarbon laboratories at AAEC under the supervision of Dr. Calf and Dr. P. Airey for about 4 months (June to Oct. 1982).

Technical Aid

1. Under this programme Malaysia will be given tritium enrichment facilities which are expected to arrive in Malaysia early next year for commissioning.

2. In view of the increasing amount of work in isotope hydrology investigation and other related acitivities, Malaysia is planning to establish a low level laboratory at PUSPATI in the near future. In this respect, Malaysia is seeking assistance through the RCA programme in term of financial, technical training and the provision of C^{14} facilities.

IV. Regional Project on the Use of Induced Mutations for the Improvement of Grain Legume Production

There are two projects that are being carried out in Malaysia under this programme. Both projects are coordinated by Universiti Kebangsaan Malaysia (UKM). The projects are:-

1. Improvement of soybean through induced mutation - carried out by UKM, UM, UPM, MARDI and RRIM.

2. Improvement of rice through mutation breeding - carried out by UKM and MARDI.

Improvement of soybean through induced mutation

The research group has carried out a considerable amount of work to date. The group has successfully developed a series of mutants (until M 7 and M 8 generations) from M 2 generation. The group, eventually, will develop mutants of good agronomic properties

which are suitable for wet tropical countries. Further work is still being carried out at UKM, RRIM, and MARDI to test the quality of other mutants developed. The results of the work, which have been successfully conducted, were presented at the Third FAO/ IAEA Research Coordination Meeting in Seoul, Korea, 4th - 8th October.

Improvement of rice through mutation breeding

The joint project undertaken (1978-1983) have produced encouraging results with regard to resistant rice mutants against blasts and brown plant hoppers. The resistance was recovered in the M 2 generation and their phenotypes were confirmed in the later generation. Information obtained from this project can be use to evaluate semi-dwarf rice varieties and to conduct genetic studies on semi-dwarfism in rice (RCA project proposal for Malaysia 1984).

Regional Cooperative Project on Food Irradiation

The participating agencies in this project are Universiti Kebangsaan Malaysia (UKM), Universiti Pertanian Malaysia (UPM) and the Malaysian Agricultural Research and Development Institute (MARDI).

Research on the effect of gamma irradiation on black pepper and white pepper was initially, started with the assistance of Universiti Kebangsaan Malaysia under project no. 44/78. It was later continued under the assistance of IAEA (Project no. 2938/JN). Recently, further assistance was granted by the IAEA under project no. 2938/JN/RI to conduct the following studies:-

(a) Determination of the effect of gamma irradiation on the storage life of pepper.

(b) Determination of the best packaging material for the irradiated pepper.

(c) Transport study by ship between Malaysia and Japan.

The research group conducting this project consists of the following members:-

4 scientific and 1 economic staff	-	UKM
1 scientific staff	-	UPM
1 scientific staff	-	MARDI

Pepper samples are provided by the Pepper Marketing Board of Malaysia while the packaging materials are provided by Wesmalex Plastic Industry and Innovative Poly Sdn. Bhd. The Malaysian International Shipping Corporation has agreed to transport the samples from Malaysia to our counterpart in Japan.

Subsequent to recommendation by the Ministry of Agriculture that more food items be considered in the food irradiation studies, another research group was formed on 11th August 1982. The group comprising researchers from the Tun Ismail Atomic Research Centre (PUSPATI), Universiti Pertanian,, Universiti Kebangsaan and the Rice Board of Malaysia will conducted feasibility studies on the use of gamma irradiation on our local paddy and rice. Among the objectives of the project are:-

(a) to increase the storage life of both paddy and rice without affecting the wholesomeness of the commodity.

(b) to determine the optimum dose for delay in ripening of paddy especially those harvested during off-season.

(c) to determine the best packaging material for the above process.

VI. Health Related Environmental Research

The national coordinator for this project is Universiti Kebangsaan Malaysia (UKM).

An inter-laboratory comparison study of a number of reference materials was initiated in 1982, to determine various elements in 5 geological and biological unknown samples supplied by IAEA. Emphasis was given to the follwoing elements; Arsenic (As), Cadmium (Cd), Mercury (Hg) and Antimony (Sb).

23 elements have been detected and analised in the samples using Nuclear Activation Analysis (NAA). Mercury (Hg) could not be determined using NAA due to long irradiation time (40 hours) which cannot be accomodated by PUSPATI at this time. However, comparing the results of the other elements with the standard samples of IAEA, the NAA technique can be considered to give satisfactory results.

The research group at Universiti Kebangsaan has successfully established a system called 'Gamma Spectroscopic Detector'. The system consists of HP Ge detector, Multichannel detector CANBERRA SERIES 85 and other accessories such as Teletype 45 printer, Plotter HP 7470A and CANBERRA casette. The whole system costs M$120,000.00 and it was financed by Research and Development Division of Universiti Kebangsaan Malaysia.

With this system, the group has started research on determination of trace-elements in human hair. Various samples have been collected within the state of Selangor. Emphasis is given to the trace-elements such as As, Cd, Sb and Hg eventhough elements such as Bromice (Br), Potassium (K) and Tungsten (W) are found present.

The IAEA contract to the value of US$9,000 will terminate on May 31st. 1983. Further research however will be continued and will be fully financed by the research grant of Universiti Kebangsaan Malaysia.

Country Statement on RCA - Pakistan

Pakistan continues to Cooperate actively in several Projects under RCA Programme. Some of these projects are:

1. Neutron Scattering Research:
(Research Reactor Utilization)

Pakistan entered into this RCA Research Contract in 1980 for one year contract. The work on study of Texture of metals by Neutron Diffraction was undertaken. Experiments were done on cold rolled Alumnium and the Texture observed was in agreement with previous workers. This was done do calibrate our neutron spectrometer with that of Seibers-dorf where earlier experiments had been done by Prof. Eder.

In the extended period 1981-1983 the texture investigations on cold rolled Copper and single crystal copper were undertaken. The later type of copper was investigated to see the history dependence of the material on its Texture. This is not understood well so far. An other area of interest and of practical importance is the texture related to the strength of material. It is thought that the study of texture could give useful information on the strength of the material, so important in our daily use of metallic sheets. The results are intended for publication in "Material Science Letters" (Holland).

The Second Project under the RCA Contract was the study of super conducting alloys using neutron scattering.

$Fe_{8.2}Si_{0.8}$ alloy was made in the laboratory and neutron diffraction of the ingot made did not show any diffraction pattern. The reasons why did this material not give the diffraction pattern are being investigated.

The third and final year of extension has just ended and if the RCA Programme of Research Reactor utilization is extended, further contracts would be applied for. The work on Texture, super-conducting alloys and on Delye-Waller Factor of materials using Neutron Diffraction method would be continued.

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2. Health Related Environment Research

Under an RCA Agreement work has been done in Pakistan on problems of trace elements in food using the neutron activation method. In particular many types of trace elements like As,Cd,Sn, Se etc have been investigated in various types of Cigarettes in use in Pakistan. Studies of these toxic elements have been made in the wrapping paper for Cigarettes.

Similarly study of trace elements of toxic of elements have also been made in various brands of tea being used in Pakistan.

An other type of work concerns the investigation of trace element Zn in Human hair. Hair from female, male and persons from different social levels were investigated. These

Current Interest:

In particular at present Pakistan is keen to get help from RCA in the project on Commercial irradiator of about 300 Kilo Curie and for setting up an NDT Centre. In both these areas Pakistan has been working for the past several years and would therefore like to advance these activities under RCA programme.

Relating to the former, Pakistan has experience in Polymerisation of materials, sterilization of medical products like Catguts and Surgical Gloves. While regarding the later, Pakistan has already experience in X-Ray and gamma-radiography and Ultrasonic testing. Some preliminary studies on Neutron Radiography using the 5 MW Swinming Pool Reactor beam have already been made. In N.D.T. Techniques Pakistan has been arranging annual short courses for Technicians/Engineers from various local industries and as well as for persons from some other countries. Based on this experience and the fact that RCA activities are becoming widely known to Pakistan, it is hoped that RCA would extend its aid to these projects.

Pakistan would also be interested to host certain meetings/workshops relevant to its programme from time to time and RCA would be requested accordingly at the appropriate time.

Pakistan would be interested to consider hosting the 7th Working Group Meeting if RCA would indicate interest in it.

investigations have yielded useful information regarding health Care. Some of the results have already been published.

Other Contracts:

Very briefly Pakistan has been involved very actively in other contracts for example in (i) Microwave induced hyperthermia as a sensitizer of radiotheraphy in head and neck tumour", (ii) on Semi-dwarf mutants for Rice - improvement, (iii) Radiation technology and Maintenance of Nuclear instruments. In addition Pakistan is Cooperating in the Project on "Radioisotope applications in Industry and Radiation Technology.

Trainees from Pakistan have participated in the NDT and Nuclear Control instrumentation Workshops held in various Member States of RCA.

In other projects of Food irradiation, Nuclear Sterilization of Medical Products (Pakistan has a long history of producing and exporting of medical instruments), Isotopes in Hydrology, Wood surface treatments by radiation, Nuclear Medicine, Radioisotope Applications in agriculture in general etc Pakistan would be keenly interested as and when RCA programme is coming to be known more and more to the relevant researchers in the field.