

DEPARTMENT OF SCIENCE AND TECHNOLOGY
PHILIPPINE NUCLEAR RESEARCH INSTITUTE

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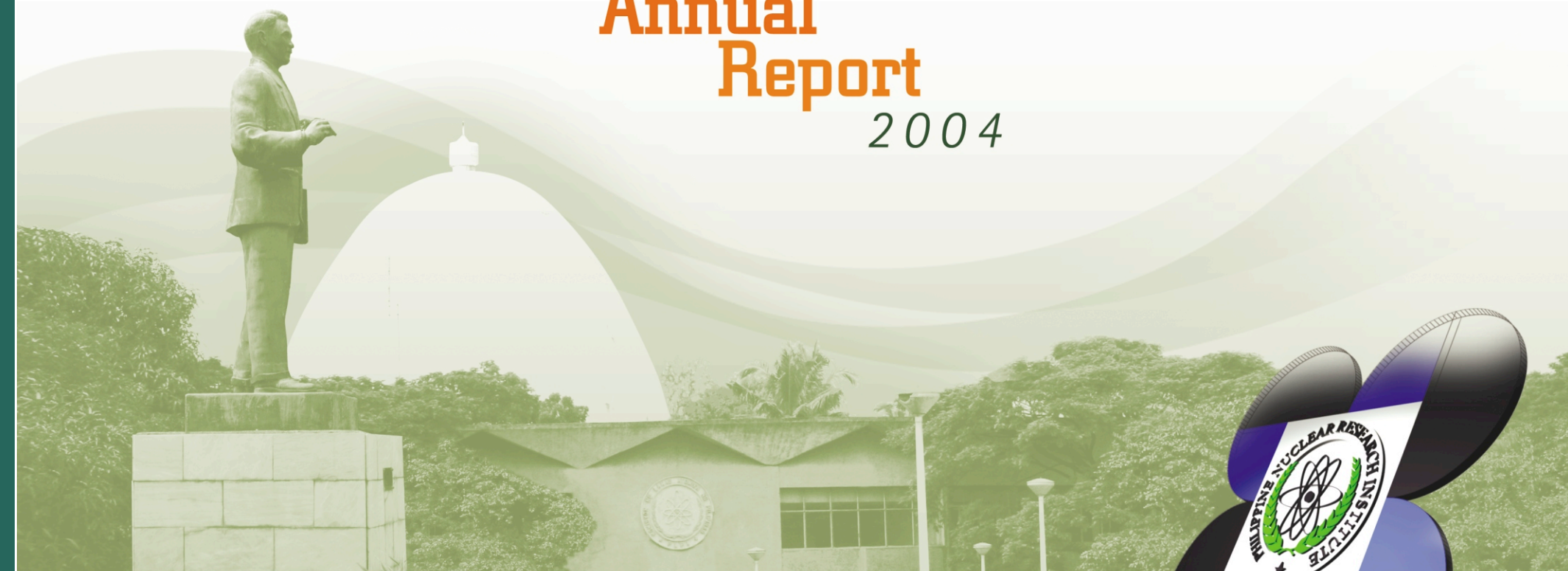
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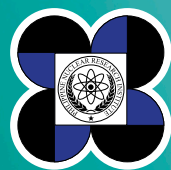
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Annual Report

2004



DEPARTMENT OF SCIENCE AND TECHNOLOGY
PHILIPPINE NUCLEAR RESEARCH INSTITUTE



PHILIPPINE NUCLEAR
RESEARCH INSTITUTE

P N R I

2004 annual report

- 2 Nuclear Research & Development
- 12 Nuclear & Allied Services
- 16 Nuclear Safety & Regulations
- 20 Administrative & Support Services
- 22 S & T Linking & Networking
- 24 Special S & T Event
- 26 Financial Statements
- 28 Appendices
- 40 PNRI Officials & Organization

About Us

The Philippine Nuclear Research Institute (PNRI), formerly the Philippine Atomic Energy Commission, has been the center of nuclear science and technology activities in the country since 1958. The PNRI is mandated to develop and regulate the safe and peaceful uses of nuclear science and technology in the Philippines.

Our Mission

"We contribute to the improvement of the quality of Filipino life through the highest standards of nuclear research and development, specialized nuclear services, nuclear technology transfer and effective and efficient implementation of nuclear safety practices and regulations."

Our Vision

The PNRI is an institution of excellence in nuclear science and technology propelled by a dynamic and committed workforce in the mainstream of national development.

Message From the Director

I am pleased to present the 2004 PNRI Annual Report. It embodies the collective accomplishments of the staff in research and innovation, nuclear services, training and information dissemination, and nuclear regulatory activities. Notwithstanding its limited resources in funds and facilities, PNRI has once again used its avowed reservoir of creativity, resourcefulness and commitment to public service, and generated results we all can be proud of, which have benefited our clients and target end-users, enhanced public safety and security, and provided the necessary scientific basis for environmental protection and sustainability.

The year past ushered in a new administration with a renewed commitment to uplift the quality of life of Filipinos. With nuclear science and technology (S & T) as an integral part of the National S & T Plan, the PNRI fine-tuned its Medium-Term Nuclear S & T Plan (2005 - 2010) to be in the mainstream of the current development agenda. This Plan will serve as our road map to enable every staff to undertake his/her role and contribute to the attainment of the Institute's mission and vision.

May I take this opportunity to extend my gratitude and appreciation to the PNRI officials and staff for their full cooperation and hard work, the support of the Department of Science and Technology (DOST), and the cooperation of our local collaborators and foreign partners in nuclear science and technology development.


ALUMANDA M. DELA ROSA, PhD
Director

Nuclear Research and Development

PNRI's research and development programs are focused on the safe and peaceful uses of nuclear techniques, materials and processes to contribute in the government's efforts of increasing agricultural and industrial productivity as well as ensuring health security and safeguarding the environment.

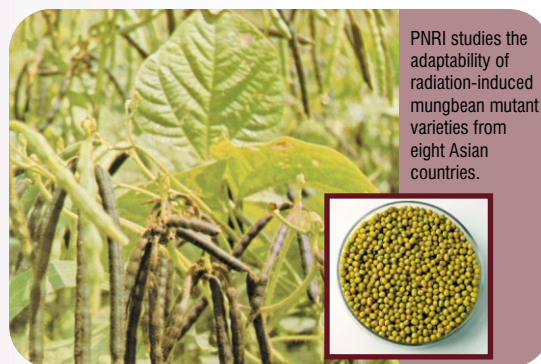
FOOD AND AGRICULTURE

The PNRI uses gamma radiation from cobalt-60 to develop new crop varieties with improved characteristics.

Mutation Breeding

Rice. The PNRI Agricultural Research Group (ARG) submitted seed samples of PNRI-developed rice mutant lines to the Philippine Rice Research Institute (PhilRice) in Muñoz, Nueva Ecija for multiplication and general performance trials. The improved mutant varieties submitted to PhilRice were the Philippine Atomic Rice Cultivar-1 (PARC-1), PARC-2, PARC-3, Bengawan mutant, Malagkit Sungsong, PNBB mutant, Denorado mutant I, and Azucena varieties. Samples of these mutant rice varieties will be stored at the gene bank at PhilRice. At the PNRI experimental field, the ARG continued to evaluate data on yield performance and agronomic traits of four mutant lines previously obtained from crosses between Japanese rice and Bengawan mutant, Azmil and Bengawan mutant, IR-8 and Denorado mutant 1, and Azucena and Denorado mutant 2.

Mungbean and Peanuts. The PNRI pursued its study on determining the general performance and adaptability to Philippine conditions of 18 high-yielding mungbean mutant varieties and ten peanut mutant varieties obtained from eight Southeast Asian countries participating in an International Atomic Energy Agency coordinated research project. This study is in collaboration with Bulacan Agricultural State College in San Ildefonso, Bulacan. In 2003, the high-yielding mungbean varieties identified were KPS 2 variety from Thailand (1.27 tons per hectare); 2917A from China (1.23 tons per hectare); PSB Mg-1 and PAEC 3 from the Philippines (1.15 tons per hectare). In 2004, the high yielding mungbean varieties selected were Psj-B-II-17-6 (0.888 tons/hectare) and Psj-8-31



PNRI studies the adaptability of radiation-induced mungbean mutant varieties from eight Asian countries.

(0.838 tons/hectare) both from Indonesia; and CN 72 (0.827 tons/hectare) from Thailand. In 2005, an additional trial will be conducted to select the most promising and high yielding mungbean mutant varieties that can be recommended for planting in the Philippines.

In peanuts, high yielding varieties identified were B/30/12/10 from Indonesia (3.15 tons/hectare); V-97 from Vietnam (3.12 tons/hectare); and Binachina badam I from Bangladesh (2.88 tons/hectare). Another trial will be conducted in 2005 to evaluate further the performance of the peanut mutant varieties.

Cashew and Mangosteen. Radiation technology, coupled with in-vitro culture and molecular marker technology, is being used by PNRI to develop high-yielding and early-maturing dwarf and non-seasonal mutant varieties of cashew and mangosteen which are important and high value crops. PNRI cooperators for this project include the



Mangosteen, one of the country's high-value crops, is being improved through radiation.

Ramon Magsaysay Technological University in San Marcelino, Zambales for the supply of cashew planting materials; the Municipal Agriculturist of Lucban, Quezon and five farmers from Lucban for the supply of mangosteen propagules. Project activities for the year focused on (1) the collection and propagation of different varieties for mutation induction and tissue culture studies, (2) the determination of the radiosensitivity of these crops to gamma radiation, and (3) growing of the M1 generation.

Soybean. The PNRI, in collaboration with the Bulacan National Agricultural State College, continued its studies on selecting mutants with good agronomic characteristics from five varieties of irradiated soybean from the Philippines and Vietnam. This year, the third and fourth generations of the five soybean varieties were grown at the PNRI experimental field to select plants that have drought tolerance, short stature, early maturity, and high yield. Preliminary results showed insignificant differences among the varieties in terms of the number of days to flower. Gradual reduction in height resulted as the dose was increased.



Radiation technology is being used to produce drought tolerant soybean varieties.

The chlorophyll mutant *Cordyline* 'Medina' has glossy green leaves with irregular creamy white, purple and red-violet stripes.

This project is being carried out as part of the Multilateral Research Program (MRP-1) of the Forum for Nuclear Cooperation in Asia (FNCA). It is being funded by PNRI through its Grants-in-Aid Program.

Ornamentals. The PNRI-developed ornamental mutants (*Murraya* 'Ibarra Santos' and *Dracaena* 'Marea') that were registered at the National Seed Industry Council (NSIC) of the Department of Agriculture in November 2001 were multiplied for commercialization.

The chlorophyll mutant *Cordyline* 'Medina' was submitted to the NSIC for registration. *Cordyline* 'Medina' has glossy green leaves with irregular creamy white, purple and red-violet stripes. A chlorophyll mutant with green leaves that have whitish and reddish stripes was also induced in *Cordyline* terminalis.

In *Freycinetia multiflora* Merr, a mutant with reduced leaf area and reduced thorns along the leaf margin was induced. In chrysanthemum, most number of plantlet formation was obtained in plants irradiated with 20 Gy dose. A total of 164 plantlets that were developed from the *Cattleya* protocorm are presently being maintained in the PNRI greenhouse.



The PNRI - developed *Cordyline* 'Medina'

Molecular Techniques in Aid of Mutation Breeding Program

A molecular technique based on AFLP polymerase chain reaction (PCR) technology was used by PNRI to isolate genomic DNA markers in leaves of four irradiated cashew plants and in one unirradiated cashew plant. Information on the AFLP-PCR DNA markers/fingerprints obtained from the crops were encoded and included in the PNRI-developed computer database for crop mutants. This database serves as a resource material for commercial plant growers and provides information for easy selection of plant variants intended for mass propagation.

During the National Training Course on the 'Application of In-Vitro, Mutation and Molecular Markers in Horticultural Crop Improvement' held at PNRI in 25 - 29 October 2004, a laboratory



Participants of the "National Training Course on the Application of In-Vitro, Mutation and Molecular Markers in Horticultural Crop Improvement" pose with IAEA lecturers and Course Director, A. G. Lapade of PNRI.

demonstration of the molecular technique was conducted by PNRI and experts from the International Atomic Energy Agency (IAEA). Participants to the course were mostly collaborators in the IAEA-funded technical cooperation project entitled "Enhancing Agricultural Productivity in Mindanao Through Radiation Technology (Component I - Fruit Crops and Component II - Rice Improvement)".

Food Irradiation

In collaboration with PNRI, the Bureau of Food and Drugs of the Department of Health (DOH) drafted the Administrative Order (AO) No. 152 "Prescribing Regulations on Irradiated Food". The draft AO was finalized with the participation of the Bureau of Plant Industry, Bureau of Fisheries and Aquatic Resources, Bureau of Health Devices and Technology, and the National Meat Inspection Services. This AO was issued to ensure safe supply of irradiated food and prevent undue risk to safety and public health in the application of ionizing radiation to reduce wastage caused by insects, microorganisms, physiological processes and to control pests of quarantine significance in food. AO No. 152 was approved by the DOH Secretary in May 2004.

Assessment of Bio-N Fertilizer for Corn Production

The PNRI conducted a field experiment at San Antonio, Ilagan, Isabela to test the efficacy of Bio-N biofertilizer as seed inoculant on growth and yield of corn using nitrogen-15 isotopic technique. Bio-N contains nitrogen-fixing bacteria of *Azospirillum spp* isolated from the local grass "talahib". This study is in collaboration with the National Institute of Molecular Biology and Biotechnology (Biotech) and the Department of Agriculture - Cagayan Valley Integrated Agricultural Researches Center - Soil and Water Management Station (CVIARC-SWMS).



A PNRI researcher shows to farmers the effects of Bio-N on corn plants during the Farmers' Field Day held at San Antonio, Ilagan, Isabela.

Results of the study showed that Bio-N can fix approximately four to six kilograms of nitrogen per hectare (kg N/ha) from the atmosphere. In terms of income, Bio-N application per hectare gave a gross income of Php 14,341.50 while the application of 80 kilograms per hectare of inorganic fertilizer gave a gross income of only Php 8,148.00. The application of one-half the recommended inorganic nitrogen fertilizer at 40 kilograms per hectare gave a gross income of Php 17,699.80 and its combination with Bio-N resulted in a gross income of Php 16,299.80. These results indicate that the use of Bio-N can offer better or at least equal monetary returns than inorganic nitrogen fertilizer application. Further experiments, however, need to be conducted for verification.

Research findings indicated that organic fertilizer (compost) can reduce the use of inorganic commercial fertilizer.

Fertilizer-N Use Efficiency in Lowland Rice-Based Cropping System

The PNRI has been using the nitrogen-15 isotopic technique to determine the best combination of inorganic (commercial) and organic nitrogen fertilizer for rice-based cropping system. PNRI conducted a field experiment for two cropping seasons in Talisay, Camarines Norte to complement the findings from two previous experiments in San Ildefonso, Bulacan and Bucal, Calamba City.

Research findings indicated that organic fertilizer (compost) can reduce the use of inorganic commercial fertilizer. The findings supplement studies conducted by other organizations on integrated use of organic and inorganic fertilizer sources and rice crop management. Additional field demonstration trial will be conducted to confirm these results.



Preparation of samples prior to N-15 determination



The Jasco N-15 emission spectrometer used for N-15 determination

Fruit Fly Control

The sterile Insect technique (SIT), a nuclear technology, has been a major component in the island-wide integrated management program on the control of Oriental fruit flies in Guimaras province. Oriental fruit flies (*Bactrocera philippinensis*) is a major pest of mangoes that



A PNRI researcher observes the fecundity and fertility of female fruit fly under a microscope.

damage at least 10 percent of the country's mango production. In connection with the fruit fly control program, the PNRI continued to carry out the following SIT activities: (1) rearing of fruit flies at the PNRI entomology laboratory to maintain the stock culture and to use the flies for various laboratory and quality control tests; (2) improving the artificial diet of the fruit flies using sugarcane bagasse; and (3) conducting tests for the improvement of sterile male performance of the Oriental fruit fly.

Improving Dairy Cattle Production

The PNRI, in collaboration with the National Dairy Authority South Luzon Island Office, has helped dairy cattle farmers improve the breeding and nutritional management of dairy cattle through the use of radioimmunoassay, a nuclear technique, and urea molasses mineral block (UMMB) feed supplementation.



The urea molasses mineral block formulated by PNRI is used as feed supplement for dairy cattle.

Through the RIA technique, PNRI obtained knowledge on the reproductive status of dairy cattle. This is helpful in increasing the reproduction of cows through proper timing of artificial insemination.

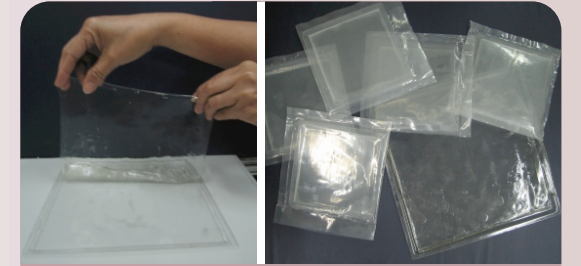
The PNRI and the National Dairy Authority conducted training and information dissemination to small holder dairy cattle farmers in northern and southern Luzon on the commercial production and benefits of the UMMB supplement. These efforts resulted in the utilization of the supplement by 90 farmers from three dairy cooperatives in southern Luzon and 35 farmers from three dairy cooperatives in northern Luzon. The UMMB is a cheaper feed supplement for dairy cattle which consists of urea, molasses, rice bran, salt, mineral premix and cement as binder.

HEALTH AND MEDICINE

Radiation-Sterilized Amniotic Membranes as Biological Dressing

A total of 775 pieces of radiation-sterilized amniotic membranes obtained from human placentas were produced by the PNRI. The membranes were collected from the Capitol Medical Center and then processed and packaged in polyethylene pouch prior to sterilization by gamma radiation at the PNRI gamma irradiation facility. The radiation-sterilized membranes were clinically utilized as biological dressing for bedsores, clubfoot surgery, open wound and second degree burns of 78 patients from various hospitals.

Gamma-irradiated PVP-carrageenan hydrogel is superior to saline gauze in treating decubitus ulcers or bedsores.



The PNRI-developed PVP carrageenan hydrogel dressing is used for treatment of wounds, burns and bedsores.

Radiation Studies of Carrageenan

Hydrogels as Dressing for Bedsores. Clinical studies were conducted on the use of the PVP-carrageenan hydrogel as an alternative to the traditional wet dressing (saline dressing) in the treatment of decubitus ulcers or bedsores. The hydrogel was developed by PNRI through radiation crosslinking technology. At the Veterans Memorial Medical Center, clinical tests were done on 61 patients with grades two to four decubitus ulcers. The effectivity of the PVP-carrageenan hydrogel dressing in the treatment of decubitus ulcers was compared to the wet dressing.

Results indicated that there was a decrease in the size of the ulcers for both the saline dressing and PVP-carrageenan hydrogel. However, decrease in ulcer size for the hydrogel dressing was significantly higher than the traditional dressing. This indicates that gamma-irradiated PVP-carrageenan hydrogel is superior to saline gauze in treating decubitus ulcers. In addition, the convenience of having to change the hydrogel dressing only every four days can ease the pain of the patient and may turn out to be more economical than the daily change requirement of the traditional wet dressing.

Development of Carrageenan Foam as Hemostat.

The PNRI, through its Chemistry Research Group, has developed a new spongy foam type of hemostatic material from gamma-irradiated carrageenan. A hemostatic material is one that shortens the clotting time of blood. The gamma-irradiated hemostat foam is similar to the imported hemostat commercially available in the form of gelatin foam (Gelfoam™). A team of surgeons from Otolaryngology-Head & Neck Surgery of the Medical City hospital conducted experimental animal studies on the effectivity of the PNRI-developed carrageenan gelfoam as a topical hemostatic agent versus Gelfoam™ and direct pressure using gauze alone. The results indicate that carrageenan gelfoam is comparable, if not superior to Gelfoam™ in arresting bleeding. The investigators suggest that the PNRI-developed gelfoam may have applications in procedures such as thyroidectomies and ear surgeries. They recommended the conduct of extensive studies, including clinical trials, to explore the other potentials of the carrageenan gelfoam.



Gamma-irradiated carrageenan hemostat foam developed by PNRI (new formulation)



Commercial Gelfoam (Ultrafoam Collagen sponge from Avitene)

Irradiated Carrageenan as Plant Growth Promoter.

PNRI has undertaken bulk preparation of 100 liters of irradiated carrageenan as plant growth promoter and irradiated chitosan as plant protector. The conditions for acid and oxidative pre-degradation were optimized to facilitate bulk preparation and to lower radiation dose to obtain oligomers of appropriate molecular weight. The



Field testing of carrageenan oligomers as plant growth promoter

obtained oligomer is now being tested on iceberg lettuce by hydroponics cultivation at a farm in Tagaytay City.

Technetium-99m Generator Production

Technetium-99 (^{99m}Tc) in saline solution and its compounds are widely used in diagnostic medical procedures. The commercial source of ^{99m}Tc is the so-called ⁹⁹Mo-^{99m}Tc generator. In this generator, ^{99m}Tc is eluted as decay daughter of ⁹⁹Mo that is adsorbed on alumina column. For the commercial generators now in use, the ⁹⁹Mo that is adsorbed on the column is high specific activity fission molybdenum.

To produce a generator using low specific activity reactor-produced ⁹⁹Mo, a column material that will



Column tests using low activity ⁹⁹Mo

absorb good quantities of molybdenum is needed. In this study, polyzirconium material (PZC) produced by Japan is being evaluated as a column material for the ⁹⁹Mo-^{99m}Tc generator. Results of tests conducted by the participating countries (the Philippines included) under the FNCA program on Reactor Research Utilization showed that PZC holds promise as a column material for the reactor-produced ⁹⁹Mo generator.

Mutational Screening for Workers Exposed to Mutagenic Agents

The PNRI and the University of the Philippines - Philippine General Hospital (UP-PGH) used the PNRI-adapted HGPRT Mutation Index Assay protocol and Autoradiographic (AR) Assay to measure mutation frequency in 50 peripheral blood samples obtained from medical workers exposed to mutagenic agents at UP-PGH.

Result of AR analysis of workers from the Oncology Department of UP-PGH showed 36 percent of workers (n=50) have greater than 1Vf (mutation frequency) value relative to 64 percent with less than 1 Vf. This indicates the possibility of workers with HGPRT gene locus mutation. However, further statistical analysis is needed for meaningful interpretation of results.

Cytogenetic Analysis

The PNRI Cytogenetics staff extended the following services to 16 clients: (1) monitoring, through blood sample analyses, of the occupational radiation exposures of workers; (2) determining/confirming the presence or absence of clinical disorders such as Down syndrome, Klinefelter's syndrome, habitual abortion, ambiguous genitalia, delayed growth in physical appearance and primary/secondary amenorrhea.

INDUSTRY**Radiotracer and Sealed Sources Applications**

Gamma Ray Scan of a Tower. A nuclear technique called gamma column scanning is being used by the Isotope Techniques Research Group (ITRG) to locate mechanical damage and diagnose process anomalies inside distillation columns of



Gamma column scanning was used to diagnose process anomalies inside distillation columns at the Shell refinery in Palawan.

refineries without interrupting normal plant operations. This year, ITRG conducted a gamma ray column scan on a C-636 methanol tower situated on the three decks of a platform of Shell Philippines

exploration located offshore in Malampaya, Palawan. During the scan, a graphic-based computer program developed by the ITRG was used for the first time. In this program, a ratemeter is interfaced to a computer.



A counting electronic device used in gamma column scanning and pipeline deposit measurement

Dam Leakage Studies. The PNRI Isotope Techniques Research Group (ITRG) conducted studies to establish the presence of leakage and predict the general leakage area in the Angat Dam reservoir using isotopic and chemical techniques. In 2003, ITRG carried out monthly tests on temperature and conductivity of water from the

reservoir and from the springs downstream. The Group also sent samples of rain water and water from the reservoir and springs to the Pakistan Institute of Science and Technology (PINSTECH) for isotopic composition (¹⁸O and deuterium) analyses.



Isotopic and chemical techniques are being used for Angat Dam leakage studies.

This year, ITRG analyzed the data obtained from the monthly tests and evaluated the results of the isotopic composition analyses done at PINSTECH. Results of the analyses indicated that there is hydraulic connection between the reservoir and most of the springs downstream and that the height of leakage in the dam ranges from elevation 182 to 187 meters while that in the main dam ranges from elevation 171 to 177 meters.

Urban Waste Management. The Isotope Techniques Research Group (ITRG) continued to study the possible migration of garbage leachate from the San Mateo landfill into groundwater with the aid of a radioactive tracer. Nine years after the injection of the radioactive tracer into the landfill, the groundwater samples were analyzed and were found negative of the tracer. This result is an indication of the integrity of the barriers against leaching at the bed of the landfill.

High Technology Materials Development

Preparation of Rare Earth-Based Ferrimagnetic Materials. The Applied Physics Research Group continued the preparation and characterization of two types of ferrimagnetic materials that have potential applications in the electronics and communications industry. These materials are the

rare earth-based ferrimagnetic garnets $R_3Fe_{5-x}M_xO_{12}$ and the rare earth-based orthoferrites $RMn_xFe_{1-x}O_3$. Studies on the preparation of thin films on appropriate substrate using self-assembly and other techniques have been started. High technology materials in the form of thin films have growing applications such as in microelectronics and in miniaturization of optical and magnetic devices. The Moessbauer spectrometer, a system for electronic and magnetic properties determination, was upgraded with a new transducer and drive system through the funding of

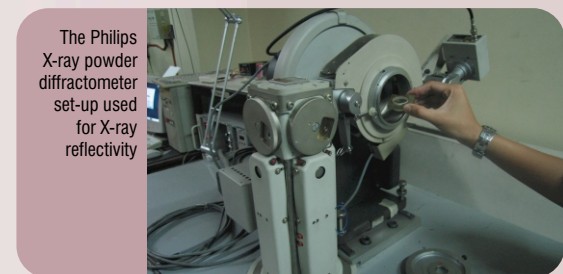


The Moessbauer spectrometer with a new transducer and drive system

the International Atomic Energy Agency (IAEA). Along with a new data collection system, the spectrometer has been tested and calibrated and will be used to observe electromagnetic properties of materials.

X-Ray Spectrometric Technique Applications.

Activities during the year focused on the following: (1) application of x-ray spectrometric techniques for surface analysis and coating thickness determination of high technology materials; (2) performance tests of a silicon side-drift



The Philips X-ray powder diffractometer set-up used for X-ray reflectivity

detector (SDD) for total x-ray fluorescence (TXRF) of thin film samples deposited on quartz substrate; (3) development of small glancing/exit angle x-ray scattering facility for characterization of high technology thin film materials; and (4) modification of the existing Philips Powder x-ray diffractometer system for reflectivity measurements.

ENVIRONMENT

Harmful Algal Bloom (Red Tide) Studies

The PNRI, through its Chemistry Research Group, has been undertaking studies on the use of nuclear techniques to assist in the management of red tide or toxic harmful algal bloom in some important aqua culture areas in the country.

Receptor Binding Assay. This assay is a useful tool for measuring the toxicity of shellfish during the occurrence of harmful algal bloom (red tide). It is also applicable for regular monitoring of shellfish to prevent paralytic shellfish poisoning (PSP) cases. The receptor binding assay can also be specially useful for the management of shellfish farms because of the sensitivity of this assay technique.

As an IAEA regional resource unit for receptor binding assay in the East Asia and the Pacific region, the PNRI hosted two visitors from Vietnam and Pakistan in 2004. The scientists observed the protocol for doing receptor binding assay of PSP toxins, primarily, the saxitoxins. Their visit included a tour of a mussel farm in Cavite, which had been affected by *Pyrodinium bahamense* var. *compressum* bloom.

PSP Toxicity Assessment. The PNRI is undertaking a study on the rate of uptake and rate of release of saxitoxins in mussels under laboratory and field conditions. The source of saxitoxin is *Pyrodinium bahamense* var. *compressum*, an organism that causes paralytic shellfish poisoning.



Scientists from Vietnam and Pakistan observe the receptor binding assay protocol at the PNRI laboratory.

The transfer of the toxin from the algal cells to mussels and its release from the shellfish are important information in assessing risks due to toxic harmful algal bloom (HAB) or red tide. It will also provide a foundation for risk management strategies that will benefit the fish and shellfish industry.

In the initial phase of the study, PNRI established the protocols for conducting the laboratory and field uptake studies of saxitoxins in mussels. Field uptake studies were done on-site in Juag Lagoon which is located off the coast of Matnog, Sorsogon in the direction of Samar island. The lagoon, about 20 hectares, has been experiencing recurrent blooms of *Pyrodinium bahamense* var. *compressum*. Analysis revealed increasing level of saxitoxin in tissues within hours of exposure of uncontaminated mussels in seawater of Juag Lagoon.

The receptor binding assay is a useful tool for measuring the toxicity of shellfish during the occurrence of harmful algal bloom (red tide).

Sedimentation / Siltation Studies in Marine Coastal Areas, Dams and Lakes

PNRI is using lead-210 dating, a nuclear technique, to measure levels and changes of sedimentation and siltation rates in water bodies. The lead-210 measurements, together with the other measurements, may be useful for resource managers in developing measures to maintain and even enhance the designated use of the water body.

In previous years, the lead-210 dating methodology had been used by PNRI to study the sedimentation rates in Manila Bay and Malampaya Sound in Palawan. For 2004, the methodology has been extended to study the the following areas/sites: (1) Laguna Lake, (2) Bolinao, Pangasinan, and (3) Sual, Pangasinan.



PNRI researchers discuss the location of the sediment sampling sites in Bolinao with an IAEA on-the-job trainee from Pakistan and a staff of the UP-Institute of Environmental Science

Based on the lead-210 profile of a Laguna Lake core, the sedimentation rate of 2.4 cm per year may be estimated. This initial estimate of the sedimentation rate of Laguna Lake is higher than that of Manila Bay. Analysis of additional samples on this core will be done to increase the level of confidence on the estimated rates derived from lead-210. For Sual, the estimated sedimentation rate for a core is 0.4 cm/year which is similar to the estimates of the lower layers of Manila Bay cores. In Bolinao, Pangasinan (site of fish kill in the past), core samples have been obtained and sample processing is in progress.

Air Pollution Source Apportionment by Nuclear and Related Analytical Techniques

The PNRI applies nuclear analytical techniques in the analysis of air particulate matter and characterization of pollutant sources. Air particulate samples are collected at four air monitoring stations, three of which are co-located with the Environmental Management Bureau (EMB) air monitoring station.

In 2004, comparative coarse and fine PM10 data were generated for three stations. The PM10 and PM 2.5 levels obtained for Valenzuela were higher than for Poveda and NAMRIA. The range of values demonstrates compliance with the short-term 24-hour national standard of 150ug/cu.m. for PM10 and the long-term standard of 65 ug/cu.m. The PM2.5 levels indicate compliance with the 24-hour standard of 65 ug/cubic meter of the United States Environmental Protection Agency (USEPA). However, the mean values are higher than the long-term standard of 15 ug/cu.m. This indicates the need for further investigation of possible health impacts of PM2.5 levels and for policies to set local PM2.5 levels.

Pollutant source apportionment for the Ateneo de Manila University campus indicated the following major sources of the fine fraction: vehicular emission (53%); oil burning (21%); and aged salt (17%). The major sources of the coarse fraction are the following: soil (48%); aged salt (33%); and vehicular emission (17%).



PNRI air monitoring station in Valenzuela City

Isotope Techniques in Water Resource Management

Davao City. PNRI researchers focused their studies on better characterization of the surface water sources using isotopic and chemical techniques since previous study indicated significant contribution of surface water to the groundwater. The determination of present levels of possible anthropogenic contamination tracers such as trace metals, nitrates, and sulfates was also carried out. This is to better assess the extent of contribution of surface water to the groundwater and the extent of contamination if it is present. If there is no contamination, baseline data will be obtained so it could be used as basis for assessing future contamination.



Measurement of physico-chemical parameters of well water

For this study, PNRI researchers collected water samples from the Talomo, Lipadas, and Davao rivers at varying elevations, and from selected wells, particularly those proximate to the rivers and those found in an earlier study to contain mixed waters. Sediment samples from selected river stations were also collected. From these samples, major ions, trace metals and other physico-chemical characteristics, ^{18}O , and ^2H were determined. Results of isotopic characterization strengthened the conclusion that Talomo and Davao rivers were contributing significantly to the groundwater. The results of trace metal determination in the groundwater and surface water generally showed no significant contamination. Except for one well, Pb and Cd levels were below the minimum limits of detection of 0.005 ppm for lead and 0.002 ppm for cadmium. Arsenic and mercury

were not detected in any of the samples. The elements Cr, Cu, Zn and Fe were detected in some samples but had concentrations below the maximum allowable limits for these metals.

Metro Manila. Using isotopic and chemical techniques, the PNRI conducted a study on the possible threat of contamination from the Montalban sanitary landfill to the water resources in the area. The study focused on (1) obtaining benchmark isotopic and hydrochemical data for the groundwater and surface water sources in the area, (2) determining baseline levels of possible contaminants such as trace metals and nitrates.

The study involved collection of water samples from selected areas and stations and analyses of the samples at PNRI. The following data were obtained from the analyses of water samples collected from selected project areas and stations: major ions Ca, Mg, Na, K, HCO_3 , Cl and SO_4 , minor ions Fe and Mn, and trace metals Cr, Cu, Zn, Ni and Pb; and initial ^{18}O and ^2H . Trace metal analysis of water samples generally showed no significant contamination. Aside from major crustal elements, the results of elemental determination in the sediment samples from rivers showed the presence of Zn, Cu and Ni in significant amounts.



Collection of water samples from production wells in San Mateo, Rizal

Establishment of CTBTO International Monitoring Stations

The PNRI, being the National Focal Authority for the Comprehensive Test Ban Treaty Organization (CTBTO), is tasked to establish a radionuclide station (PHP-52) and a National Data Center (NDC-PH) in the Philippines. As part of this commitment, PNRI continues to operate the NDC-PH which is located at the PNRI compound in Diliman, Quezon City. Radionuclide and seismic data from monitoring stations of States Signatories could be accessed upon request from the NDC-PH via the VSAT antenna system only for research purposes.

The PNRI assisted the CTBTO Contractors in the installation and completion of the infrastructures for a PHP-52 station in Tanay, Rizal. PHP-52 is a Radionuclide Monitoring Station and co-located at the PAGASA-DOST Weather and Radar Station in Tanay.

Other accomplishments include the following: (1) successful installation of infrastructures at PHP-52 station which include the gamma radiation detector system, air sampler and both the outdoor and indoor antenna; and (2) successful connection of the telecommunications system to the geo-satellite hub in Australia for transmittal of data to CTBTO-IMS in Vienna, Austria.

The station is now on its initial testing phase by the CTBTO contractor. Testing and evaluation activities are expected to start in October 2005. Post certification activities, the operation and maintenance phase, will start in January 2006 after



Setting up of the VSAT antenna for the CTBTO radionuclide monitoring station in Tanay, Rizal

12/16/2004

station certification at the end of December 2005 by CTBTO. Station operators are from PNRI and PAGASA and some were trained in Vienna.

Radiological Assessment of Former US Bases

Under the DOST-Grants-in-Aid Program, the PNRI conducted a study on the level of radioactivity of Subic Bay Freeport and Economic Zone (SBFEZ) to determine the possible presence of radioactive contaminants due to its former use as a U.S. military installation. The information generated from the study would be useful in planning clean-up measures in case radioactive materials are found in the area.

As part of this study, the following activities were carried out: (1) collection of samples of seawater, soil, sediments and biota by PNRI with assistance of the Subic Bay Metropolitan Authority (SBMA)

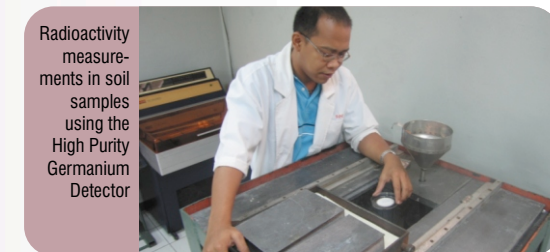


Collection of topsoil in Subic for the analysis of naturally-occurring (K, U, Th) and anthropogenic (Cs-137) radionuclides

Ecology Center; (2) pre-processing on-site of water samples for cesium-137 analysis; (3) measurement of ambient gamma dose rates using portable gamma spectrometer (SAM 935); and (4) analyses of sediments for gamma radiation concentration of specific radionuclides using HPGe. Initial results indicated concentration of gamma radiation within background levels in areas monitored.

Management of Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM)

The PNRI has successfully completed the project on "Management of TENORM Released into the Environment at the Philippine Phosphate Fertilizer Plant (PHILPHOS) at Isabel, Leyte". The final project report was submitted to the PHILPHOS and



Radioactivity measurements in soil samples using the High Purity Germanium Detector

local government units of Isabel, Leyte. The project results included the following information: (1) measurements of radioactivity levels in phosphogypsum - a technologically-enhanced naturally-occurring radioactive material (TENORM), which is considered a by-product in the production of phosphate fertilizer at PHILPHOS, LIDE in Isabel, Leyte; (2) assessment of the possibility of using the phosphogypsum as reclamation filling materials; and (3) an assessment of release of radioactive materials into the surrounding areas of the industrial plant and background radioactivity for the proposed site for the reclamation area.

Soil Erosion and Associated Sedimentation Studies

The PNRI has been undertaking studies on soil erosion and associated sedimentation in agricultural uplands using a nuclear analytical technique. The technique involves the measurement of cesium-137 in soil profile. Cs-137 was introduced to the environment from the atmospheric nuclear weapon testing in the late



Soil sampling in cultivated agricultural areas

50's and early 60's, and consequently deposited in the soil particles. The basis of the technique is that once Cs-137 adhere to the soil surface, it is fixed and is non-exchangeable, making the radionuclide an efficient tracer of soil movement and redistribution. The Cs-137 content of soil was measured using high purity Germanium detectors. These measurements were converted to estimates of soil erosion/sedimentation rates using calibration models.

Initial data on soil erosion rates and redistribution using FRNs (Fall-out Radionuclides) were collected in three important agricultural areas in the Philippines, namely Bukidnon, Nueva Ecija and Isabela. The data are useful in understanding the magnitude, extent and pattern of soil redistribution in these study areas so as to be able to formulate measures for soil erosion and prevention.

Survey of Nuclear Materials

Northern Palawan. An updated technical report entitled "Mineral Resource Assessment for Rare Earth Deposits in Ombo area, San Vicente, Northern Palawan" was completed. Based on this report, an investigation involving the establishment of shallow test pits with depths varying from 1.5 to 2.2 meters delineated a prospective area of 4,200 square meters with a cut-off value of 500 grams heavy minerals per cubic meter of sands. This cut-off value was

considered the lowest concentration of heavy minerals, which could be recovered economically if extraction would be undertaken. The measured reserve of this delineated area is 44,000 kilograms of rare earth heavy minerals with an average grade of 20.96 percent rare earth elements (cerium, lanthanum) and 0.46 percent thorium was determined. This reserve was based on the computed volume of approximately 8,300 cubic meters of beach sand deposits containing an average concentration of 5,300 grams heavy minerals per cubic meter of sands.

Laboratory-scale experiments have been undertaken to recover the rare earth elements and thorium from the beach sands in the Ombo area.

The radon gas concentration in soil may serve as indicator of a seismic activity or a tool to predict an earthquake.

gamma ray spectrometric surveys will be utilized in producing elemental and baseline radiation maps of Batan island.

Radon Monitoring

Radon monitoring was conducted monthly in 19 established stations along Eastern Marikina Valley Fault System (from Montalban up to Marikina) and Western Marikina Valley Fault System (from Montalban to Biñan, Laguna). The monitoring involves the measurement of radon (a naturally-occurring radioactive gas) in soil in these stations to establish baseline data for these fault systems. The radon gas concentration in soil may serve as indicator of a seismic activity or a tool to predict an earthquake. So far, all radon measurements indicated that there are no significant changes in the level of activity in the monitored stations.



The portable gamma ray spectrometer (inset) is used in the field to measure naturally-occurring radioactive elements.

Nuclear and Allied Services

The PNRI extends nuclear and allied services to clients from industrial, business, medical, government and the academic sectors to encourage and widen the safe and peaceful uses of nuclear science and technology in various fields.

Gamma Irradiation Services

PNRI uses the Multipurpose Gamma Irradiation Facility and the Gammacell-220 to irradiate product samples from various clients to gamma radiation. The Gammacell-220 was used to irradiate 169 samples from 39 clients composed mostly of students. The samples irradiated for research purposes included mice, seeds, fruit fly and moth pupae, onions, ornamental plants and orchid protocorms.

On the other hand, PNRI used the Multipurpose Gamma Irradiation Facility to irradiate 3,978 samples from 49 clients in the food, medical and pharmaceutical industries. The products irradiated included the following: (1) for microbial decontamination: spices, dehydrated vegetables, frozen fruits, cosmetic raw materials, dye and animal feeds; (2) for sterilization: frozen bone grafts, amnion and orthopedic implant; and (3) for research: honey, hydrogel, carrageenan, sugar cane bagasse and Oriental fruit fly pupae.



A radiation label for category II package is placed on a box containing iodine-131.

Radioisotope Production Services

In 2004, a total of 43 orders, amounting to 37,268 MBq iodine-131, were dispensed and supplied to nuclear medicine centers and hospitals. The hospitals served include the Lung Center of the Philippines, Makati Medical Center, Metropolitan Hospital, Philippine General Hospital and Rizal Medical Center.

Engineering Services

The Engineering Services Group completed several jobs for both PNRI and non PNRI clients, mostly from the medical and industrial sectors. These activities included: (1) 123 jobs on the repair and maintenance of radiation detection equipment/instruments and non-nuclear devices such as densitometer and distillation apparatus; (2) decommissioning of two disused teletherapy machines in Iloilo and Cebu City; and (3) putting



Decommissioning of a disused teletherapy machine in Iloilo

into operation two thyroid uptake machines of the Veterans Memorial Medical Center and Jose R. Reyes Memorial Medical Center.

For the Institute, the Group also completed the following: (1) 108 jobs for the repair and maintenance of electro-mechanical devices/equipment; (2) 41 jobs for the fabrication of mechanical parts, tools and devices such as metal and wooden crates; and (3) participation in ten PNRI projects on the repair and upgrading of PNRI facility infrastructures.

Nuclear Training

A total of 310 medical practitioners, science educators, researchers, engineers and technicians from various government and private institutions attended the 22 training courses conducted by

PNRI in 2004. These courses familiarized the participants with the fundamentals of nuclear science and technology, radiation safety and the peaceful uses of nuclear technology in agriculture, medicine, industry and in research and the environment. From these courses, nine were on nondestructive testing (NDT); two seminars were on nuclear science for high school science teachers and for university and college faculty; nine were on radiation safety, and two were on industrial uses of radioisotope techniques.

The PNRI extended on-the job training/thesis advisorship 83 students from 21 secondary schools/universities. The PNRI training staff also arranged/coordinated the conduct of in-house seminars/lectures on nuclear science and technology at PNRI.

Computer Services

The Computer Services Group managed, maintained and improved the PNRI LAN/Internet including the internet servers and the PNRI website. The expansion of the LAN to the modular laboratories and external PNRI buildings using a fiber-optic backbone was also started. The Group maintained and operated the PNRI N-137 station, which is part of PNRI's commitment to the Comprehensive Test Ban Treaty Organization (CTBTO).

The conversion of the PNRI Payroll from a DOS-based system to the Windows platform was completed during the year. This will facilitate maintenance and modifications that the system requires during its operation. The Group also completed 13 modifications of existing application software and attended to the documentation and production of user manuals for these packages. A total of 371 computer-related requests and 70 consultations were also addressed by the Group. Collaboration with other DOST research agencies was likewise continued with regard to the project entitled "Test Analysis and Calibration Information System". This project was approved by the

Information Technology and E-Commerce Council (ITECC).



Processing of thermo-luminescent dosimeters for radiation dose evaluation

Radiation Protection Services

The PNRI, through the Radiation Protection Services (RPS), continued to provide different radiation protection services to authorized users of radiation and radioactive materials throughout the country. These services ensure that the public and workers occupationally exposed to radiation are not unnecessarily exposed to ionizing radiation. (Please refer to Table 1 for a list of the services extended by RPS for 2004.) Other services were storage of radioactive materials, use of liquid scintillation counting and area/air monitoring in various PNRI facilities.

TABLE 1: RADIATION PROTECTION SERVICES - 2004

| | | |
|----------------------------------------------------------------------------|---|--------------------------------------------------------------------------------|
| National film badge service | – | 46,122 badges issued 6,800 personnel monitored 1,970 institutions served |
| Thermoluminescent dosimetry (TLD) | – | 4,228 TLDs issued 641 personnel monitored 88 institutions served |
| Calibration of radiation protection instruments/nuclear medicine equipment | – | 521 instruments calibrated 299 clients served |
| Leak testing of sealed radioactive sources | – | 304 sources 75 institutions served |
| Management of spent sealed sources | – | 27 units 8 institutions |
| Management of solid wastes | – | 11.13 cubic meters 9 institutions served |
| Management of liquid wastes | – | 136.55 liters 7 institutions served |
| Calibration of radioactivity meter | – | 15 units |
| Audit of teletherapy facility | – | 2 facilities |
| Swipe sample counting | – | 245 units 78 institutions served |
| Rental of survey meter | – | 37 units rented 37 institutions served |

Library Services

The PNRI Library received and acquired 100 publications composed of books and journals from local and foreign organizations. These publications, together with about 20,000 volumes of library holdings, were made available for use of around 2,087 clients composed mostly of students. Library services on accessing and retrieving documents from the International Nuclear Information System (INIS) database on CD-ROM was made available to the clients. INIS maintains a database containing bibliographic references and abstracts on nuclear technology worldwide.

To further expand the PNRI Library resources, the Library staff participated in the DOST SCINET project on Union Catalogue on Web and the Philippine eLib project. The eLib project is endorsed by Information Technology and E-Commerce Council (ITECC) and funded under the E-governance fund. One of its components is the digitization of the PNRI Filipiniana collection.



The PNRI Library is open to the public from Monday to Friday, 8:30 AM to 4:30 PM



The PNRI-developed multimedia CD -- *The Atom, Radiation and Radioactivity* -- is an interactive learning resource material for students.

Nuclear Information Services

The PNRI, through its Information Services Group, continued to implement various information and communication strategies to increase the awareness of the public about the benefits of nuclear technology. The nuclear information activities conducted by PNRI were the following:

Development/Distribution of Information Materials. The Institute developed and produced five new brochures and flyers on PNRI technologies and services; updated nine existing flyers and brochures; and took charge of the production of 1,000 copies of the 2003 PNRI Annual Report. Around 28,000 copies of these materials were distributed to more than 10,000 clients. The PNRI also updated and reproduced 1,250 copies of the CD-based multimedia presentation entitled "The Atom, Radiation and Radioactivity". A total of 313 copies of the CD were availed of by students, educators and researchers during the year. Two banners on the sterile insect technique and on the use of carrageenan as plant growth promoter were likewise produced. The



latter was exhibited during the 5th FNCA Meeting in Vietnam in November 2004. Through financial assistance from the Technology Application and Promotion Institute (TAPI), the Institute produced seven banners which were exhibited during the 15th DOST Science and Technology Fair at Legazpi City in July. A 15-minute video presentation on "Controlling Fruit Flies Through the Sterile Insect Technique" was also completed for the year.

Educational Tours and Seminars. Guided tours of the Institute's facilities, laboratories and viewing of the scientific exhibits, lecture-demonstrations and audio-visual presentations on nuclear science and technology were the information services made available to around 7,550 visitors who came to the PNRI for their educational tour. The visitors were composed mostly of students, teachers and researchers from 80 schools and institutions. A total of 20 seminars/lectures for 1,736 clients were likewise conducted at PNRI and in different government and private secondary schools and colleges as part of generating greater public awareness in nuclear science and technology.



PNRI information officer briefs IBC-13 TV production staff on the PNRI-developed mutant plants.



Students were informed on the beneficial uses of nuclear technology at the PNRI exhibit in Legazpi City.

Participation in S & T Events. The PNRI promoted nuclear technology and its beneficial uses to more than 10,500 clients through exhibits in the following science and technology (S & T) events: 15th annual DOST technology fair in Legazpi City, Albay; DOST Visayas cluster S & T fair in Cebu City and regional S & T fair in Bulacan; in two school science and technology fair exhibits in Quezon City and UPLB in Los Banos. The Atomic Energy Week (AEW) celebration at PNRI in December also provided a good opportunity to highlight the recent breakthroughs and accomplishments on various aspects of nuclear energy through guided tour of visitors to PNRI laboratories and facilities and video showing during the AEW open house celebration.

Mass Media Linkages. Media publicity has been one of the effective strategies that PNRI undertakes to inform the public about the beneficial applications of nuclear technology. This year, six press/news releases were prepared; 11 radio and televisions interviews of PNRI officials and technical staff were coordinated/broadcasted. The topics covered by the tri-media included the following: radiation safety, Atomic Energy Week celebration, current PNRI projects, radiation effects on air filters in Texas Instruments (a former PNRI licensee), and types of radiation.



PNRI Director Alumanda M. dela Rosa is interviewed by a TV news reporter.

Media publicity has been one of the effective strategies that PNRI undertakes to inform the public about the beneficial applications of nuclear technology.

Nuclear Safety and Regulations

The PNRI, as mandated by law, promulgates and enforces nuclear regulations to ensure that the use of radioactive materials is carried out safely and in accordance with international safety standards. An effective regulatory control program has been established such that use of radioactive materials for peaceful applications would not pose unnecessary risk to the general public, to workers occupationally exposed to radiation and to patients undergoing diagnostic and therapeutic procedures using radiation and radioactive materials.

Standards Development

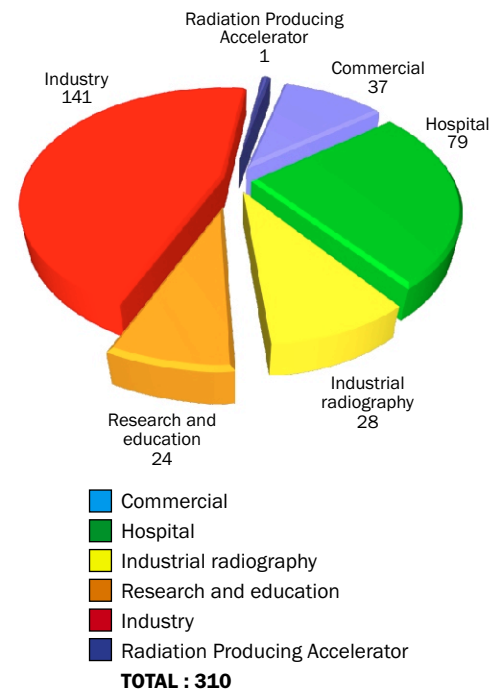
To further enhance safety in the use of radioactive materials in the country and to assist licensees in complying with regulatory requirements, the Standards Development Section (SDS) continued to develop, review and revise regulations, regulatory bulletins, regulatory guides and model procedures. This year, two PNRI regulations and two administrative orders were published in the Official Gazette in September and October, respectively. These were CPR Part 3 (Standards for Protection Against Radiation) and CPR Part 4 (Regulations for the Safe Transport of Radioactive Material in the Philippines); Administrative Order No. 1, series of 2004 (Adoption of IAEA TECDOC-1344 Categorization of Radioactive Sources); Administrative Order No. 3, Series of 2004 (Procedure for the Imposition of Regulatory Sanction for Violations of PNRI Licensing and Regulatory Requirements Relative to the Acquisition, Possession and Use of Radioactive Materials). The SDS also issued regulatory bulletins on Appointment of Radiological Health and Safety Officers, Preparation and Issuance of the Certificates of Transport, and Incident Reporting Requirements for Radiography Licensees. A regulatory guide (RG) for CPR Part 20 (RG for the Preparation of Application for Licenses to Manufacture and Dispense Radiopharmaceuticals) was likewise completed for the INFOPAC for Part 20.

In addition, the SDS organized and coordinated the conduct of two PNRI regulatory conferences on the published Code of PNRI Regulations (CPR) Part 3 "Standards for Protection Against Radiation" and CPR Part 4 "Regulations for the Safe Transport of Radioactive Materials in the Philippines". Users of radioactive materials and other stakeholders attended the two regulatory conferences to discuss the various issues relative to the implementation of the two CPRs.

Licensing Review and Evaluation

The Licensing, Review and Evaluation (LRE) reviewed and evaluated applications for new, renewal and amendments of licenses for authority to store, use, possess, own, sell and import radioactive materials. This year, the LRE processed 317 licenses (248 renewal, 57 amendments and 12 new) of 280 government and 37 private institutions. Likewise, applications for termination of licenses of 10 institutions were also processed.

Distribution of Licensed Users According to Classification



LRE head verifies radiation levels during removal of depleted sealed sources from weighing devices in a coal-fired thermal power plant.

The LRE prepared 551 certificates of release for sealed radiation sources for the Bureau of Customs to release imported radioactive materials to licensed users of radioactive materials. The group also actively participated in the development of an internal regulatory control program for PNRI nuclear and radiation facilities and laboratories and completed program application forms for waste management facility, irradiation facility and authorization for research reactor. Other major accomplishments included the following: (1) preparation of an evaluation checklist for nuclear medicine, summary of radioactive materials used in medicine and guides for the disposal of carbon-14 wastes; and (2) initial implementation of the categorization of sealed sources and the revised docket numbering system.

Inspection and Enforcement

The Inspection and Enforcement Section (IES) conducted regulatory inspection and audit of radioactive materials and facilities for 182 licensees out of 248 licensees scheduled for the year. Regulatory inspections and records audit were carried out to verify licensees' compliance with PNRI regulations and the specific conditions

of their licenses. Special and follow-up inspections were done to monitor the status of implementation or completion of corrective actions taken by licensees to resolve significant findings of non-compliances as reported during regular inspections.

About 45 percent of the licensees that were inspected were found to have reasonably complied with the regulatory requirements specific to the authorized practice. Items of non-compliance were found in the remaining number of licensees where specific corrective actions were required by PNRI to be instituted. Regulatory enforcement actions that were implemented included: (1) regulatory custody of a strontium-90 ophthalmic applicator of a government hospital for non-renewal of license within a presented period; (2) Suspension Order to one licensee for repeated violations of safety requirements; and (3) Letter of Reprimand to one licensee for a number of violations of specific safety related requirements.

For the period under review, the IES also processed 926 Certificates of Transport and prepared the corresponding Authority to Transport Sealed Radioactive Sources which were issued to 163 licensees.



Verification of compliance with PNRI regulatory requirements at a nuclear medicine facility.

Regulatory inspections and records audit were carried out to verify licensees' compliance with PNRI regulations and the specific conditions of their licenses.



The participants of the Design Basis Threat Workshop pose with (seated from left) Julietta Seguis (Head, PNRI Safeguards Section), Pierre Legoux (IAEA), Peter Colgan (ARPANSA), Guy Jones (Sandia Nat'l Lab, USA), PNRI Director Alumanda M. dela Rosa, DOST Assistant Secretary Jocelyn Alvarado, PNRI Deputy Director Corazon C. Bernido, Euliria M. Valdezco (Chief, PNRI Nuclear Regulations, Licensing and Safeguards Division), Estelita G. Cabalfin (OIC, NSTD, PNRI - 2nd row, third from left) and Virginia S. Calix (OIC, ARD, PNRI - 2nd row, fourth from left).

Safeguards

The Safeguards Unit (SG) in cooperation with the International Atomic Energy Agency (IAEA) conducted the Design Basis Threat (DBT) Workshop in April. The seminar was participated in by representatives from national government agencies concerned with national security, intelligence and defense. The PNRI also conducted a one-day seminar on The Ratification of the Additional Protocol at the Department of Foreign Affairs (DFA) in November in cooperation with the International Atomic Energy Agency and in coordination with the DFA. The participants were representatives from the Philippine Senate Committee on Foreign Relations and their counterparts at the Congress (Please see appendices).

The Safeguards Unit also (1) supervised the decommissioning of two disused teletherapy

machines at the Dr. Daniel Ledesma, Jr. Clinic in Iloilo City and the Vicente Sotto Memorial Medical Center in Cebu City; (2) coordinated the annual IAEA safeguards inspections at the Philippine Research Reactor-1 at the PNRI compound and the Bataan Nuclear Power Plant in Morong, Bataan in December 2004; (3) provided inputs to the UN Security Council Resolution 1540, Convention on Physical Protection of Nuclear Material, and the Convention on the Prohibition of the Use of Nuclear Weapons; (4) coordinated the schedule and program of activities of the on-going United States-Department of Energy (US DOE) Mission concerning the US DOE/Battelle-PNRI project on the security upgrades of critical infrastructures in the country. The project, which covers security upgrades of facilities utilizing large and high risk radiation sources, is about 50 percent complete. The facilities under the project include the Multipurpose Irradiation Facility, PNRI Radioactive Waste Management Facility, and oncology centers in the country.

The Design Basis
Threat Workshop was
participated in by
representatives from
national government
agencies concerned
with national security,
intelligence and
defense.

Radiological Impact Assessment (RIA)

The Radiological Impact Assessment (RIA) Group assessed the health and environmental risks involved in some regulatory issues and concerns and non-compliance of PNRI licensees. The radiological impact on the workers and members of the public for the management of carbon-14 wastes by a licensee was evaluated. Similarly, evaluations of the impacts of the use of phosphorus-32 (P-32), nickel (Ni-63), polonium-210 were performed to support the regulatory function of the Institute. The health and environmental risks involved in the theft of cobalt-60 activated beam ports used in the Philippine Research Reactor (PRR-1) were also estimated.



The PNRI, through the RIA, implemented the work activities on the IAEA-Technical Cooperation project on site selection and conceptual design of a low to intermediate level radioactive wastes facility in the Philippines in collaboration with an Inter-Agency Committee created and tasked for this purpose. In coordination with a technical consulting firm, the RIA and the Inter-Agency Committee completed site investigation and evaluation of the candidate sites for the proposed project. IAEA expert missions for rendering technical assistance to the project in areas of licensing and regulations, site investigation and evaluation, safety assessment were completed in accordance with an agreed work plan for the project.

Comparative Assessment of Nuclear Power Plants and Other Electricity Generating Power Plants.

The PNRI, through the Radiological Impact Assessment Section, completed the implementation of the Regional Cooperative Agreement (RCA) Project on the "Role of Nuclear Power and Other Energy Options in Competitive Electricity Markets" in cooperation with the representatives from eight government institutions. The Philippine case study that used country specific data and information using the MESSAGE (Model for Energy Supply Strategy Alternatives and their General Environmental Impacts) computer model was completed and reported to the IAEA. The study examined the possible impacts and mechanisms in increasing the share of renewable energy capacity as well as determined impacts and mechanism in increasing the share of renewable energy mix. The national team that undertook the study was composed of representatives from the PNRI, Department of Energy, Department of Science and Technology, Department of Trade and Industry, National Power Corporation, National Economic Development Authority, and National Electrification Administration.

Radiological Emergency Planning and Preparedness. The PNRI, through the RIA Section, continued to lead and coordinate the activities of the Technical Working Group on Medical Radiological Emergency Response to develop the country's medical response capability in the event of a radiation-related emergency or a nuclear terrorist attack. A set of protocols and procedures for the medical management of victims of radio-nuclear emergencies were prepared and are being reviewed by the members of the Technical Working Group. A conference/meeting to discuss the proposed revision of the National Radiological Emergency Preparedness and Response Plan (RADPLAN) document was held on 22 September 2004. The meeting, which was participated in by 22 representatives from 12 member agencies, was conducted under the auspices of the Task Force for the Security of Critical Infrastructures of the Cabinet Oversight Committee on Internal Security.

The RIA continued to facilitate the PNRI's participation as national competent authority and contact point under the Convention on Early Notification of a Nuclear Accident (Early Notification Convention) and the Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency Assistance Convention of the IAEA.

The PNRI also continued its participation in the meetings and activities of the National Disaster Coordinating Council (NDCC).

Administrative and Support Services

The Finance and Administrative Division (FAD) provides advice and assistance in policy formulation relative to fiscal and administrative matters. FAD also provides administrative, financial and auxiliary services for the successful implementation of the Institute's programs.

Personnel Administration

Total No. of Personnel: 249

Distribution by Personnel: Total 249

By Gender

| | |
|--------|-------|
| Female | - 137 |
| Male | - 112 |

By Staff Category

| | |
|----------------|-------|
| Managerial | - 4 |
| Technical | - 181 |
| Administrative | - 64 |

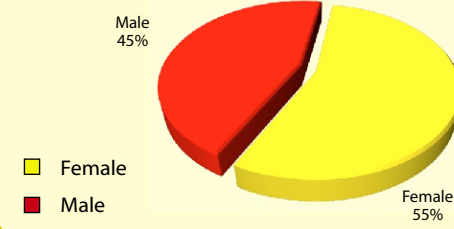
By Staff Activity

| | |
|--------------------------|------|
| Research and Development | - 78 |
| S & T Services | - 62 |
| S & T Education | - 7 |
| Regulatory | - 33 |
| Administrative | - 69 |

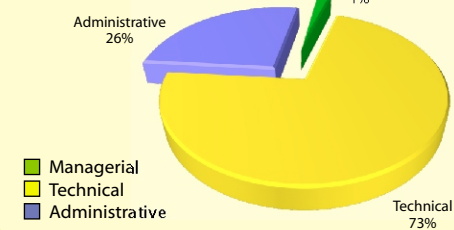
By Education

| | |
|----------|-------|
| Ph.D. | - 6 |
| MS/MA | - 33 |
| BS/BA | - 161 |
| Below BS | - 49 |

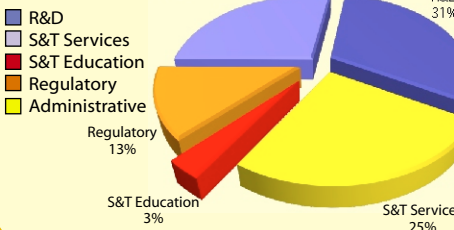
By Gender



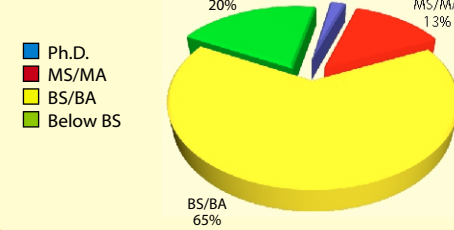
By Staff Category



By Staff Activity



By Education



PNRI SERVICE AWARDS

2004 Retirees

Armando M. dela Cruz
Expectacion P. Duca
Loreto P. Galler
Restituto B. Ilagan
Eriberto A. Rementilla
Pilar C. Roceles
Antonio T. Tiong

30 Years

Corazon C. Bernido, Ph.D.
Jean M. Casyao
Conrado M. de Guzman
Teofilo Y. Garcia
Dolores M. Lazo
Leonardo S. Leopando
Lucia J. Marbella
Federico L. Pineda, Jr.
Virgilio S. Santiago
Rodrigo A. Tabios

20 Years

Aurelio L. Maningas
John M. Marquez

PNRI RECOGNITION AWARD

2004 Model Employee



Bernard M. de Lara
Budget Officer I
Finance and Administrative Division

- Certificate of Recognition and cash award given for enhancing data processing leading to marked improvement in the operation of the Finance and Administrative Division

"On-the-Spot" or "Gantimpala Agad" Award



Luvimina G. Lanuza
Senior Science Research Specialist
Irradiation Services
Nuclear Services and Training Division

Haydee M. Solomon
Science Research Specialist II
Irradiation Services
Nuclear Services and Training Division

Estrella S. Caseria
Senior Science Research Specialist
Radiation Protection Services
Nuclear Services and Training Division

- Certificate of Recognition given for maintaining the Multipurpose Gamma Facility Dosimetry System at a high level of quality as certified by the International Dose Assessment Service, International Atomic Energy Agency

HIGHLIGHTS OF PNRI EMPLOYEES UNION ACTIVITIES



The PNRI Senior Staff and the PNRIEU Board after signing of the Collective Negotiation Agreement (CNA) on February 18, 2004.



PNRI delegation to the 2004 DOST Summer Olympics in April at the Philippine Science High School grounds.

S&T Linking and Networking

Through the years,
PNRI has established
and maintained
linkages with both
local and foreign
institutions in order
to enhance the
Institute's
capabilities.

The PNRI, as the
Philippine focal agency
for atomic matters,
serves as a link
between IAEA and
government and
private entities using
atomic energy in the
country.

LOCAL LINKAGES

Additional linkages were forged by PNRI this year to further advance the beneficial applications of nuclear science and technology in the country.

International Maritime Organization (IMO) and Department of Environment and Natural Resources (DENR). PNRI served as chair of the interagency Technical Working Group (TWG) on the IMO-Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) project on Integrated Environmental Monitoring Program for Manila Bay. The TWG has submitted to the IMO and DENR the Inception Report on the Integrated Environmental Monitoring Program (IEMP). This report completes Phase I of the TWG tasks and activities. The TWG is now working on Phase 2 to draft the IEMP and pilot test plan.

Bureau of Plant Industry (BPI) and Department of Agriculture (DA). As chair of the Experts Group on Food Irradiation, the PNRI collaborated with BPI and DA to formulate the project proposal entitled "Enhancing the Export Competitiveness of Fresh Philippine Super Mango". BPI submitted the proposal to the United States Department of Agriculture (USDA) for financial assistance.

Other Agencies/Institutions. Projects in the field of health, medicine and industry were carried out in collaboration with the following institutions: Department of Science and Technology (DOST), Technology Application and Promotion Institute, Philippine Phosphate Fertilizer, Philippine Council for Advanced Science and Technology Research and Development (PCASTRD), Bureau of Soils, and Del Monte Philippines. (Please see Appendices, Table 3, page 29).

FOREIGN LINKAGES

A number of International organizations involved in nuclear science and technology development have continued to provide valuable assistance and support in the furtherance of the peaceful uses of nuclear technology in the country. These institution partners include the following international organizations:

- International Atomic Energy Agency (IAEA), Vienna, Austria
- Regional Co-operation Agreement (RCA) for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific
- RCA Regional Office (RCARO)
- Forum for Nuclear Cooperation in Asia (FNCA)
- Comprehensive Nuclear Test Ban Treaty Organization (CTBTO)
- Other organizations from Australia, Japan, Canada, United States, Korea and other countries through bilateral agreements / institute-to-institute agreements



Special S&T Events

The safe and beneficial uses of nuclear science and technology were highlighted during the celebration of the 32nd Atomic Energy Week (AEW) on December 6-10 at the PNRI in Diliman, Quezon City. The guiding theme for the AEW celebration was “Nuclear Safety and Security Towards National Stability”.

AEW guests DOST Secretary Estrella F. Alabastro (3rd from left) and Quezon City Mayor Belmonte with PNRI Director Alumanda M. dela Rosa (2nd from left) and PNRI-NRLSD Chief Eulinia M. Valdezco, 32nd AEW Chairperson.

Quezon City Mayor Feliciano Belmonte, Jr. was the keynote speaker during the 32nd AEW celebration.



DILG Undersecretary Wenceslao Andanar was guest speaker during the AEW closing ceremonies.



A staff from Analytical Measurements Research Group explains PNRI's air pollution studies to AEW visitors.

International Atomic Energy Agency (IAEA) Technical Officer Reyad Kamel (5th from left) and other guests from IAEA visit the AEW exhibit together with DOST Secretary Estrella F. Alabastro, Quezon City Mayor Feliciano Belmonte, Jr., PNRI Director Alumanda M. dela Rosa, other PNRI officials and retired PNRI staff.



The participants and the panel of reactors for the technical session on December 8: (from left) Dr. Emerita Barrenechea (PSNM), Dr. Orestes Monzon (PARP) and Nathaniel de Vera (RSP)



AEW Opening Ceremonies

The keynote speaker for the AEW opening ceremonies on December 6 was Quezon City Mayor Feliciano Belmonte, Jr. DOST Secretary Estrella F. Alabastro gave a message.

AEW Open-house and Technical Exhibits

Around 5,000 visitors composed mostly of high school students were given free guided tours to the nuclear research and service facilities and laboratories of the PNRI during the week-long AEW celebration. Other daily activities for the AEW celebration included film showing and viewing of exhibits featuring products from nuclear technology and the nuclear research and regulatory programs and services of PNRI.

Scientific Sessions

Scientific sessions were held on December 7 and 8 at the PNRI auditorium. The topics presented on December 7 were National Strategy on the Safety and Security of Sources: The Adoption of the New International Atomic Energy Agency Categorization of Sources: Its Implications on Safety and Security and

Emergency Preparedness and Nuclear Safeguards and Security Sources; Philippine Perspective. These topics were discussed by PNRI Director Alumanda M. dela Rosa, Ms. Eulinia Valdezco, Chief, Nuclear Regulations, Licensing and Safeguards Division, PNRI and Juliet Seguis, OIC of PNRI's Safeguards Section, respectively. The Technical session on December 8 focused on Strengthening the Philippine Regulatory Infrastructure for the Safety of Radioactive Materials and Facilities. A regulatory conference on the Code of PNRI Regulations, Part 3: Standards for Protection Against Radiation and Code of PNRI Regulations, Part 4: Rules and Regulations on the Safe Transport of Radioactive Materials in the Philippines were conducted during this session. Representatives from various professional organizations such as the Philippine Association of Radiation Protection (PARP), the Radioisotope Society of the Philippines (RSP), and the Philippine Society of Nuclear Medicine (PSNM) constituted the panel of reactors in the session.

Nuclear Science Quiz 2004

The team from Torres High School composed of Jake Tan and Alvi Jonathan Sait were the first place winners of the Nuclear Science Quiz 2004 (NSQ'04) held on December 8. The other winners in the NSQ'04 were: Rodolfo Anthony Semira, Jr. and Jonathan Gonzales of Manila Science High School, second place; Jason Miraflor and Matthew Poral of Quirino High School, third place; Jonel Padre Juan and Rodneybill Flores of Ernesto Rondon High School, fourth place; and Keon Karl Medina and Xylene Angelique Azurin of Quezon City Science High School, fifth place. The NSQ'04 was held in cooperation with the Department of Education -National Capital Region and was sponsored by the Office of the Mayor, Quezon City.



32nd Atomic Energy Week Celebration

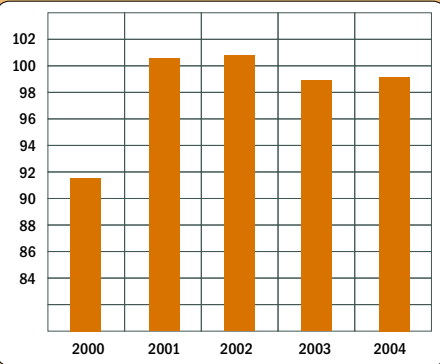
FINANCIAL STATEMENTS

STATEMENT OF FINANCIAL OPERATIONS

January to December 2004

| | Allotment | Obligations | Balance* |
|---------------------------------------------------------|---------------------|---------------------|---------------------|
| General Administration and Support | | | |
| General administration and support services | Php 29,035,224.53 | 29,035,224.53 | 0.00 |
| Subtotal | 29,035,224.53 | 29,035,224.53 | 0.00 |
| Support to Operations | | | |
| Supportive to nuclear activities | 1,906,700.00 | 1,906,700.00 | 0.00 |
| Subtotal | 1,906,700.00 | 1,906,700.00 | 0.00 |
| Operations | | | |
| Nuclear Research Technology Development and Application | 26,426,006.50 | 26,426,006.50 | 0.00 |
| Nuclear Services and Training | 23,034,801.41 | 23,034,801.41 | 0.00 |
| Nuclear Regulations, Licensing and Safeguards | 9,760,502.87 | 9,760,502.87 | 0.00 |
| Subtotal | 90,163,235.31 | 90,163,235.31 | 0.00 |
| Special Allotment Release Order | | | |
| Retirement & Life Insurance | 5,117,000.00 | 5,113,082.05 | 3,917.95 |
| Premium Terminal Leave and Retirement | 1,262,269.000 | 1,262,268.50 | 0.50 |
| Gratuity Use of Excess Income* | 1,363,604.00 | 0.00 | 1,363,604.00 |
| Total Special Allotment Release Order | 2,625,873.00 | 1,262,268.50 | 1,363,604.50 |
| *Continuing Appropriations: 2003 - 2004 | | | |
| GFA Furniture, Fixtures and Books Outlay | 1,259,450.00 | 1,259,450.00 | 0.00 |
| GRAND TOTAL | 99,165,558.31 | 97,798,035.86 | 1,367,522.45 |
| * Continuing appropriations for 2005 | | | |

Appropriations in Million Pesos



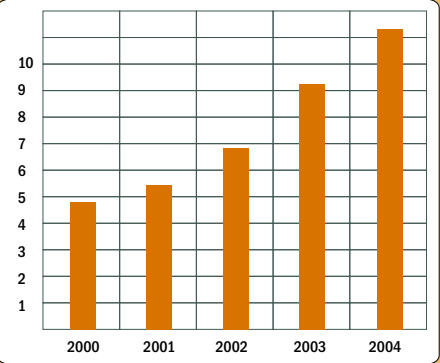
FINANCIAL STATEMENTS

STATEMENT OF ACTUAL INCOME

January to December 2004

| | |
|--------------------------------------------------------------------------|--------------------------|
| Government Service | |
| Licensing fees, etc. | 990,290.00 |
| Inspection fee | 601,110.00 |
| SUBTOTAL | Php 1,591,400.00 |
| Government Business Operations | |
| Sale of radioisotopes (Iodine-131) | 160,780.00 |
| Sale of Information Packages (INFOpacks), and tubing set | 7,108.50 |
| Sale of CD on the Atom | 28,574.00 |
| Sale of plants | 13,650.00 |
| Sale of amnion dressing | 36,750.00 |
| Rental/Repair of nuclear instrument | 88,620.00 |
| SUBTOTAL | Php 335,482.50 |
| Others - Service Fees for | |
| Cytogenetic Laboratory Services | |
| -Cytogenetic analysis | 19,500.00 |
| -Microscopy services | 900.00 |
| Microbiological Tests of Food/Medical and Pharmaceutical Products | 118,950.00 |
| Radioactivity Analysis | |
| -Gammametric analysis | 219,500.00 |
| -Gross radioactivity (alpha and beta) analysis | 506,700.00 |
| -Radiological Analysis | 4,600.00 |
| Nuclear-Based Analytical Services | |
| -Mass determination of samples | 46,800.00 |
| -Qualitative X-ray fluorescence (XRF) analysis (ex. air filters) | 4,200.00 |
| -X-ray diffraction (XRD) data collection/analysis | 18,035.00 |
| -Vinegar adulteration analysis | 31,500.00 |
| -Non-radioactivity certificate | 14,600.00 |
| Radiation Protection Services | |
| - Calibration of radiation protection instruments | 421,390.00 |
| - Leak test of sealed radioactive sources | 425,505.00 |
| - Radiation monitoring | 18,100.00 |
| - Smear/swipe tests for radioactive contamination | 27,600.00 |
| - Monitoring films and cassettes (film/TLD badges) | 6,551,786.42 |
| - Decommissioning of nuclear facilities/equipment | 8,200.00 |
| - Radioactive waste storage/disposal | 342,490.00 |
| Gamma Column Scanning | 200,000.00 |
| Use of Cobalt-60 Irradiation Facility | 768,915.00 |
| Other Income | |
| -Sale of unserviceable equipment | 38,805.60 |
| -Xerox/Fax Charge, excess deposit, bid documents | 5,815.00 |
| SUBTOTAL | Php 9,793,892.02 |
| Fines and penalties | |
| Surcharge (Permits & Licenses) | SUBTOTAL |
| | Php 14,542.50 |
| GRAND TOTAL | Php 11,735,317.02 |

Income in Million Pesos



appendices

| TABLE 1. IAEA RESEARCH CONTRACTS | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------|
| RESEARCH PROJECT | CHIEF INVESTIGATOR | AGENCY |
| • Development of Quality Control Procedures for Mass-produced and Released Fruit Flies | Sotero S. Resilva | PNRI |
| • Improvement of Mass Rearing Methods for Bactrocera philippinensis | Sotero S. Resilva | PNRI |
| • Improvement of Sterile Male Performance of Oriental Fruit Fly, Bactrocera philippinensis, Programmes | Glenda B. Obra | PNRI |
| • PSP Toxicity Risk Assessment Accumulation and Elimination of Saxitoxin in Green Bay Mussels Using Nuclear Techniques Quality Control of Pesticide Products | Elvira Z. Sombrito Ma. Esperanza Uy | PNRI Bureau of Plant Industry |
| • Development of Deletion Mutants of Tomato Hawaii 7996 for Resistance to Ralstonia Solanacearum and Other Important Traits by Targeted EMS and Irradiation Mutagenesis | Hyde Flandez-Galvez | Institute of Plant Breeding |
| • Generation of Variability in Avocado Through Somaclonal Variation and In-Vitro Mutation | Renato Avenido | Institute of Plant Breeding |
| • A Study of Body Composition, Nutritional Status and Energy Expenditure of the Filipino Elderly | Gemma Yuchingtat | Food and Nutrition Research Institute |
| • Selection of Greater Agronomic Water Use Efficiency in Rice for Salt Affected Areas Using Carbon Isotope Discrimination | Abdelbagi Ismail | International Rice Research Institute |
| • Simulating Water and Nitrogen Interactions in the Rice-Wheat Cropping System | Jagdish Ladha | International Rice Research Institute, Laguna |
| • Evaluation of a Simplified Method of Perfusion Only Lung Scan Compared to Standard V/Q and Spiral CT in Patients with Pulmonary Disease | Gerard Fabian Goco | St Luke's Medical Center |
| • Nitrate-Augmented Myocardial Perfusion Imaging for the Assessment of Myocardial Viability | Jerry Obaldo | Philippine Heart Center |
| • Comparative Evaluation of Radiophramaceuticals for Radiosynovectomy in the Philippines | Emerenciana Barrenechea | St. Luke's Medical Center |
| • Application of Tritium and Hydrofluorocarbons as Geothermal Vapor-phase Tracers in Geothermal Reservoir Management | Manuel S. Ogena | Philippine National Oil Co. -Energy Development Center |

| TABLE 2. IAEA TECHNICAL COOPERATION PROJECTS | | |
|--------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| RESEARCH PROJECT | COUNTERPART | AGENCY |
| • Human Resources Development and Nuclear Technology Support | Pilar C. Roceles | PNRI |
| • Enhancing Agricultural Productivity Through Radiation Technology in Mindanao | Avelina G. Lapade Ma. Delia Morados Leocadio S. Sebastian | PNRI DOST XI - Davao City Philippine Rice Research Institute |
| • Neonatal Screening for Congenital Hypothyroidism | Carmencita D. Padilla Teofilo O.L. San Luis, Jr. Teresita Bonoan | UP - National Institute of Health Santo Tomas University Hospital Department of Health |
| • Nuclear Techniques to Study the Red Tide Problem | Alumanda M. dela Rosa Rhodora V. Azanza | PNRI Marine Science Institute |
| • Nuclear Analytical Techniques for Air Quality Management | Flora L. Santos Cesar Siador, Jr. Leni Quirit | PNRI Environmental Management Bureau University of the Philippines |
| • Large - Scale Gamma Irradiation Services | Estelita G. Cabalfin | PNRI |

| TABLE 2. IAEA TECHNICAL COOPERATION PROJECTS | | |
|----------------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| RESEARCH PROJECT | COUNTERPART | AGENCY |
| • Isotope Hydrology Application in Water Resources Management | Soledad S. Castaneda Carol Balagtas Ricarte Javelosa | PNRI Manila Water Co., Inc. Presidential Task Force on Water Resources Management & Development |
| • Gas Isotope Geochemistry for Geothermal Resources Management | Manuel S. Ogena | PNOC-Energy Development Center |
| • Site Selection and Conceptual Design of a Near-Surface Disposal Facility | Eulinia M. Valdezco Angelita Brabante Clarissa Cabacang | PNRI Dept. of Energy and Natural Resources Department of Energy |

| TABLE 3. GRANTS-IN-AID FROM OTHER AGENCIES | | |
|------------------------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------------------------------|
| PROJECT TITLE | PROJECT LEADER (PNRI) | FUNDING AGENCY |
| • Technological Innovation Commercialization Program: Radiation Processing for Philippine Industries | Estelita G. Cabalfin | Department of Science and Technology (DOST) |
| • Radiation Processing of Carrageenan for Health Care Applications -Year II | Alumanda M. dela Rosa | Phil. Council for Advanced Science and Technology Development (PCASTRD) |
| • Detection of Synthetic Acid Adulteration in Selected Vinegar Brands | Flora L. Santos | Del Monte Philippines |
| • National Metrology Program: Upgrading of the National and Regional Metrology Laboratory | Alumanda M. dela Rosa | DOST |
| • The Use of Cs-137 in Estimating Soil Erosion and Sedimentation | Richard M. Balog | Bureau of Soils and Water Management |
| • Management of Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) | Teresa Y. Nazarea | Philippine Phosphate Fertilizer (PHILPHOS) |
| • Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) | Ma. Teresa Y. Nazarea | DOST |
| • Radiological Surveillance of the Former Military Bases | Ma. Teresa Y. Nazarea | DOST |
| • Fabrication of PNRI Radiation Survey Meter | Eduardo T. Cabildo | Technology Application and Promotion Institute (TAPI) |
| • Fabrication of Exhibit Materials for the 15th DOST Annual Science and Technology Fair | Rhodora R. Leonin | TAPI |
| • Reproduction and Promotion of PNRI Multimedia Presentation in CD-ROM | Rhodora R. Leonin | TAPI |

| TABLE 4. EXPERTS/MISSIONS | | |
|---------------------------------------------------------------------------------------|------------------|----------------------|
| FIELD/PURPOSE | NAME | DATE |
| • Site Inspection of the RN-52 Station in Tanay, Rizal (CTBTO) | Herbert Gohla | 28 - 29 Jan '04 |
| • Positive Matrix Factorization Method for Evaluation of Air Pollution Data; RAS/7013 | Wanna Chueinta | 26 April - 7 May '04 |
| • Regulatory Issues and Licensing | Ernst Warnecke | 23 - 27 Feb '04 |
| • Siting of Near Surface Radioactive Waste Disposal; PHI/9/023 | Ramesh Dayal | 22 - 25 March '04 |
| • Regulatory Issues and Licensing; PHI/9/023 | Graham Smith | 29 March - 2 Apr '04 |
| • Radiation Processing of Polysaccharides; RAS/0/035 | Nguyen Quoc Hien | 31 May - 26 June '04 |

| TABLE 4. EXPERTS/MISSIONS | | |
|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------|
| FIELD/PURPOSE | NAME | DATE |
| • National Workshop on Design Basis Threat | Pierre Legoux; Peter Colgan; Guy Jones | 25 Apr - 1 May '04 |
| • QA Program for Radioactive Waste Management; INT/4/131 | Alper Kahraman | 31 May - 4 June '04 |
| • Market Trial of Irradiated Food; RAS/5/042 | Gary Luckman | 12 - 19 June '04 |
| • Decommissioning of Research Reactor | Michele Laraia; Dennis Reisenweaver | 21 - 25 June '04 |
| • Mass Spectroscopy for Isotope Hydrology; RAS/8/092 | Mohammad Azam Tasneem | 14 - 23 June '04 |
| • Siting and Site Selection | Robert Chaplow | 2 - 6 Aug '04 |
| • Radiation Safety Infrastructure Appraisal (RaSIA) | Belkacem Djermouni with S. Evans, A. Murray, P. Ravindra, and A. Ranjit | 9 - 13 Aug '04 |
| • International Regulatory Review Team (IRRT) Mission | George Philip and Don Macnab | 9 - 13 Aug '04 |
| • Nuclear Safety Research Association | Yutaka Kawakami | 9 Aug - 8 Oct '04 |
| • Evaluation of IAEA Activities in the Frame of Regional Cooperative Agreements | Kamal Araj and Oscar Gonzales Hernandez; | 6 - 7 Sept '04 |
| • Medical Exposure | Kanae Nishizawa | 13 - 14 Sept '04 |
| • Establishment and Implementation of the Quality Assurance/ Management System for the PRR-1 | Heriberto Boado-Magan, Nestor Pieroni, Adrian Verkooijen | 27 Sept - 8 Oct '04 |
| • Nuclear Power Development | Atsushi Takeda | 4 - 5 Oct '04 |
| • National Training Course on Application of In Vitro Culture, Mutation and Molecular Markers in Horticultural Crop Improvement | Shri Mohan Jain, Sergio Ochatt, Perry Gustafson, Alan Shulman | 25 - 29 Oct '04 |
| • Seminar on Ratification of the Additional Protocol | Jan Lodding, J. Plumb | 15 - 16 Nov '04 |
| • Safeguards Inspectors | J.Plumb, S. Dulinan | 17 - 18 Nov '04 |
| • Safety Assessment | Graham Smith | 21 - 26 Nov '04 |
| • Maintenance and Repair of Nuclear Medical Instruments | Rokon Uddin | 22 Nov - 3 Dec '04 |
| • Review and Assessment of DOST Research and Development Institutes (RDIs) | Reyad Kamel, Peter Roberts, Cherif Hadj Slimane, Florence Boisson | 6 - 10 Dec '04 |
| • RCA Master's Degree Programme in KAIST | Kong Hyun Kim, Gyuseong Cho, Dae Ki Kim | 10 Dec '04 |
| • RCA Regional Office (Promotion of Visibility and Viability | John Chung and Dr. Kun Mo Choi | 12 - 19 Dec '04 |
| • US Department of Energy (DOE) Mission | Dan Rutherford, Kim Kauben, Ann Kohnen | 12 - 19 Dec '04 |

| TABLE 5. PNRI HOSTINGS | | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------|------------------------------------|-----------------|
| FIELD | PHILIPPINE PARTICIPANT | AGENCY/INSTITUTE | ORGANIZER | VENUE | DATE |
| • Regional Training Course (RAS/7/011) on the Application of Nuclear and Isotopic Techniques to Identify the Source and Distribution of Contaminants in Heavily Polluted Coastal Regions | Alejandro Q. Nato, Jr. and Efren J. Sta. Maria Ma. Yvaine Yacat Leo Pagdingalan Lilibeth Candelita | PNRI Marine Science Institute | PNRI | PNRI | 12 - 21 Jan '04 |
| • 3rd Research Coordination Meeting on the Use of Non-Structural Protein of Foot-and-Mouth Disease Virus to Differentiate Between Vaccinated and Infected Livestock | Blesilda Verin | Bureau of Animal Industry (BAI) | PNRI BAI | Cebu City | 5 - 9 Jul '04 |
| • Regional Training Course on Occupational Radiation Protection | Ma. Teresa L. Borras, Jade R. Dungao, Reynaldo S. Jimenez, Aurelio L. Maningas Elizabeth Mendoza | PNRI | PNRI | PNRI | 23 - 27 Aug '04 |
| • Progress Review Meeting on Data Interpretation, Fingerprinting and Source Apportionment of Air Pollution (RAS/8/096) on Modification of Natural Polymers Through Radiation Processing | Rosalina V. Almoneda, Soledad S. Castañeda, Preciosa Corazon B. Pabroa | PNRI | PNRI | UP- National Computer Center | 25 - 29 Oct '04 |
| • Meeting (RAS/8/096) on Modification of Natural Polymers Through Radiation Processing | Alumanda M. dela Rosa, Lucille V. Abad, Lorna S. Relleve | PNRI | PNRI | PNRI | 13 - 17 Dec '04 |

| TABLE 6. PLACEMENTS FOR FELLOWSHIP/SCIENTIFIC VISIT TO THE PHILIPPINES | | | | | |
|------------------------------------------------------------------------|----------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------|--------------|
| FIELD | NAME | AGENCY/INSTITUTE | PLACE OF FELLOWSHIP | DATE | SPONSOR |
| ON-THE-JOB TRAINING | | | | | |
| • Soil Science, Irrigation and Plant Nutrition | Ania Citraresmini | National Nuclear Energy Agency (BATAN), Indonesia | International Rice Research Institute | 1 Sep - 24 Dec '04 | IAEA |
| SCIENTIFIC VISIT | | | | | |
| • Radionuclide and Radiation in Aquatic Biology | Thuoc Chu Van | Haiphong Institute of Oceanology, Vietnam | UP-Marine Science Institute | 26 - 30 Jan '04 | IAEA |
| | Riffat Mahmood Qureshia | Pakistan Institute of Nuclear Science and Technology | PNRI | 29 March - 2 Apr '04 | IAEA |
| | Vu Nhu Ngoc Khalid Khan | Nuclear Institute, Vietnam Pakistan Institute of Nuclear Science and Technology | PNRI PNRI | 29 March - 2 Apr '04 3 May - 2 Jun '04 | IAEA IAEA |
| | Wisychudin Faisal | National Nuclear Energy Agency, Indonesia | UP-Marine Science Institute | 6 - 17 Sep '04 | IAEA |
| • Plant Breeding and Genetics | U Khin Soe | Myanma Agricultural Service | International Rice Research Institute; Philippine Rice Research Institute | 14 - 18 June '04 | IAEA |
| • Rice Breeding | Akbar Ali Cheema | Pakistan Atomic Energy Commission | International Rice Research Institute | 6 - 10 Sep '04 | IAEA |
| • Soil Science, Irrigation and Plant Nutrition | Mun Hwan Koh | National Institute of Agriculture Science and Technology, Korea | Fertilizer and Pesticides Authority | 27 Sept -1 Oct '04 | IAEA |
| • Biometrics and Biostatistics in Rice Breeding | Ghulam Rasul Tahir | Pakistan Atomic Energy Commission | International Rice Research Institute | 11 - 15 Oct '04 | IAEA |

| TABLE 7. NON-PNRI MANPOWER DEVELOPMENT (FOREIGN) | | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------|---------------------|---------|
| FIELD | NAME | AGENCY/INSTITUTE | PLACE OF FELLOWSHIP | DATE | SPONSOR |
| ON-THE-JOB TRAINING | | | | | |
| • Nutritional and Health- Related Environmental Studies | Khervin Cheng Chua | Manila Observatory | USA | 1 - 30 Jun '04 | IAEA |
| • Groundwater Hydrology | Jeoffrey Caranto | PNOC-Energy Development Center | Austria | 30 Aug -30 Oct '04 | IAEA |
| TRAINING COURSE | | | | | |
| • QA of Physical and Technical Aspects in Radiotherapy | Fernando Serrano Arlen Sudario | Tan Kim Ching Cancer Center Zamboanga City Medical Center | USA | 12 - 23 Jan '04 | IAEA |
| • Medical Management for Radiation Accident | Roberto Dalmacion | Quirino Memorial Medical Center | Japan | 1 - 5 March '04 | IAEA |
| • Organizational Reporting and Certification Aspects of Proficiency Tests | Teresita Portugal | Food and Nutrition Research Institute | Austria | 8 - 19 March '04 | IAEA |
| • Introductory Course and Technical Training Programme for Station Operators and National Data Center Managers | Edwin Cabatbat | PAGASA | Austria | 8 - 19 March '04 | CTBTO |
| • Code of Practice for Tissue Banks Regarding the Radiation Sterilization of Tissues | Emily Tanchuling | Makati Medical Center | Argentina | 3 - 6 May '04 | IAEA |
| • Role of Nuclear Power and Other Energy Options in Competitive Electricity Markets | Danilo Vivar Marietta Quejada | Department of Energy | Korea | 7 - 18 June '04 | IAEA |
| • Molecular Detection of Tuberculosis and HBV/HCV | Ligaya Picazo | Research Institute for Tropical Medicine | Malaysia | 9 - 13 Aug '04 | IAEA |
| • Physical Protection of Nuclear Installations | Aldred Limoso | Armed Forces of the Philippines | India | 4 -1 2 Oct '04 | IAEA |
| • Prevention of Accidental Exposure in Radiotherapy | Emmanuel Legaspi Efren Madrid | Western Visayas Medical Center Rizal Medical Center | Malaysia | 4 - 8 Oct '04 | IAEA |
| • Medical Applications and Utilization of Cyclotrons and Radioisotopes | Rhodora Ledesma | Makati Medical Center | Korea | 9 - 29 Oct '04 | KOICA |
| • Serological Techniques for FMD Diagnosis and Control | Rosalinda Arvesu | Bureau of Animal Industry | Thailand | 11 - 22 Oct '04 | IAEA |
| • Siting of Deep Geological Repositories and the Fundamentals of Geological Disposal | Carlo Arcilla | University of the Philippines- National Institute of Geological Sciences | Czech Republic and Switzerland | 16 - 26 Nov '04 | IAEA |
| • Interventional Methods in Nuclear Medicine | Arlene Ong Michelle Duldulao Bernard Marcelo | St Luke's Medical Center Philippine Heart Center for Asia University of Sto.Tomas Hospital | India | 6 - 10 Dec '04 | IAEA |
| WORKSHOP/SEMINAR | | | | | |
| • International Seminar on Nuclear Safety: Course on Dissemination of Nuclear Knowledge | Alethea Florido | V. Mapa High School | Japan | 16 -2 5 Feb '04 | RADA |
| • Regional Training Seminar on National Safeguards and the Additional Protocol | Ma. Victoria Castro | National Security Council | Australia | 7 - 25 Feb '04 | IAEA |
| • Mini-Workshop on Radiation Oncology for Nasopharyngeal Cancer | Miriam Joy Calaguas | St. Luke's Medical Center | Japan | 23 - 24 Jul '04 | MEXT |
| • FNCA Workshop on Mutation Breeding | Olivia Damasco | Institute of Plant Breeding | Indonesia | 30 Aug - 3 Sept '04 | MEXT |
| • Sub- Regional Seminar on Measures to Monitor, Detect, Identify and Respond to Incidents Involving Nuclear and Radioactive Materials at Borders | Lissa Belle Villanueva Nicomedes Enad Julian Advincula, Jr. | Philippine Coast Guard Bureau of Customs Philippine Navy | Malaysia | 6 - 8 Sept '04 | IAEA |

| TABLE 7. NON-PNRI MANPOWER DEVELOPMENT (FOREIGN) | | | | | |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------|---------------------|---------------------|------------|
| FIELD | NAME | AGENCY/INSTITUTE | PLACE OF FELLOWSHIP | DATE | SPONSOR |
| • International Seminar on Nuclear Security (For Managers and Decision Makers) | Abraham Purugganan Silverio Alarcon, Jr | Cabinet Oversight Committee for Internal Security - Office of the President PNP - SAF | USA | 11 - 22 Oct '04 | IAEA |
| • Use of Irradiation for Sanitary and Phytosanitary Purposes | Theresa Guita Luben Marasigan | Bureau of Food and Drugs Bureau of Plant Industry | Thailand | 12 - 14 Oct '04 | IAEA |
| • International Seminar on Nuclear Safety Course on Dissemination of Nuclear Knowledge | Manolo Pena Luisito Evangelista | Gregorio Perfecto High School Philippine Normal University | Japan | 13 - 22 Dec '04 | MEXT/ RADA |
| • FNCA 2004 Workshop on Radiation Oncology | Rey delos Reyes Miriam Joy Calaguas | Jose R Reyes Memorial Medical Center St Luke's Medical Center | Thailand | 14 - 17 Dec '04 | MEXT |
| MEETING | | | | | |
| • 1st Regional Coordination Meeting on Effects of Mutagenic Agents on the DNA Sequence in Plants | Hayde Flandez-Galvez | Institute of Plant Breeding | Austria | 1 - 5 March '04 | IAEA |
| • Interregional Meeting on Radiation Protection for Cardiologists | Jose Rogelio Tincungco | Philippine General Hospital | Austria | 3 - 4 March '04 | IAEA |
| • 1st Regional Cooperation Meeting of Body Composition for Older Adult Subjects with Different Lifestyles | Gemma Yuchingtat | Food and Nutrition Research Institute | Austria | 29 March -2 Apr '04 | IAEA |
| • Application of Isotope Techniques in Groundwater Contamination(for Senior Managers of End-Users Depts.) | Jenelyn Gemora Noelito Abesamis | Bacolod City Water District Manila Water Co. | India | 7 - 9 Apr '04 | IAEA |
| • 2nd Research Coordination Meeting on Nitrate Augmented Myocardial Imaging for Assessment of Myocardial Viability | Jerry Obaldo | Philippine Heart Center | Austria | 4 - 6 Oct '04 | IAEA |
| • Mineral Bioavailability Assessment | Trinidad Trinidad | Food and Nutrition Research Institute | UK | 4 - 6 Oct '04 | IAEA |
| • Final Project Review Meeting on Improving Animal Productivity | Patricia Tigno | National Dairy Authority | Thailand | 11 -1 5 Oct '04 | IAEA |
| • Final Review and Assessment Meeting on RAS/8/092 - Investigating the Environment and Water Resources in Geothermal Area | Guima A. Urbino Noel Salonga Manuel Ogena | PNOC-Energy Development Center | Malaysia | 25 - 29 Oct '04 | IAEA |
| • Project Progress Review Meeting on Genetic Diversity | Connie Reano | Institute of Plant Breeding | Korea | 29 Oct - 3 Nov '04 | IAEA |
| • Strategic Meeting on Nuclear Techniques for Rice Improvement in Asia | Thelma Padolina | Philippine Rice Research Institute (PHILRICE) | Japan | 4 - 7 Nov '04 | IAEA |
| • Train the Trainers Meeting - Radiation Protection in Medicine | Segundina Medina | | Thailand | 22 - 26 Nov '04 | IAEA |
| CONFERENCE/SYMPOSIUM | | | | | |
| • Nuclear Oncology | Emerita Barrenechea | Veterans Memorial Medical Center | Brazil | 19 - 23 Jan '04 | IAEA |
| • Conference of Project Participants and End-Users (RAS/7/013) | Ma. Delia Morados | DOST Region XI | Sri Lanka | 18 - 19 Nov '04 | IAEA |
| SCIENTIFIC VISIT | | | | | |
| • Nuclear Law | Jocelyn Alvarado | DOST | France and Austria | 23 Aug -10 Sept '04 | IAEA |
| • Plant Breeding and Genetics | Rolando Cruz | Philippine Rice Research Institute (PHILRICE) | Israel | 7 - 18 Nov '04 | IAEA |
| • Plant Breeding and Genetics | Alfonso Antonio | Philippine Rice Research Institute (PHILRICE) | France | 22 - 26 Nov '04 | IAEA |

| TABLE 8. PNRI MANPOWER DEVELOPMENT (FOREIGN) | | | | |
|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|---------------------|---------------------|---------------|
| FIELD | NAME | PLACE OF FELLOWSHIP | DATE | SPONSOR |
| ON-THE-JOB TRAINING | | | | |
| • Radiation Protection | Fe M. dela Cruz | Australia | 2 Feb-1 May '04 | IAEA |
| • Analytical Chemistry | Estrellita E. Tabora | Australia | 2 Feb- 1 Jun '04 | IAEA |
| • Soil Science, Irrigation and Plant Nutrition | Richard M. Balog | Australia | 16 Feb - 15 Apr '04 | IAEA |
| • Radioactive Waste Management | Estrella S. Caseria | Australia | 2 May-17 Jul '04 | IAEA |
| • Industrial Pollution Studies and Non-Radioactive Effluent Disposal | Reynaldo V. Pedregosa | Normay | 3 May-2 Sep '04 | IAEA |
| • Radiation Protection | Ma. Lucia C. Cobar | USA | 1 Jun- 31 Jul '04 | IAEA |
| • Radiation Processing of Agrowastes | Miitos Tolentino | Korea | 30 Aug - 30 Nov '04 | IAEA |
| • Nuclear Instrumentation, Electronics and Reactor Control | Randy V. Salazar | Indonesia | 22 Nov-21 Dec '04 | IAEA |
| TRAINING COURSE | | | | |
| • Security of Nuclear Research Facilities | Julietta E. Seguis Nelson P. Badinas Alfonso A. Singayan | Australia | 2 - 13 Feb '04 | IAEA |
| • Introductory Course for Station Operators and National Data Center Managers | Ana Elena L. Conjares Eliza B. Enriquez | Austria | 8 - 12 March '04 | CTBTO |
| • Organizational Reporting and Certification Aspects of Proficiency Tests | Preciosa Corazon B. Pabroa | Austria | 8 - 19 March '04 | IAEA |
| • Hands-On Training for National Data Center Managers | Anal Elena L. Conjares | Finland | 15-17 March '04 | CTBTO |
| • Technical Training Program for Radionuclide Station Operators | Eliza B. Enriquez | Austria | 15-19 March '04 | CTBTO |
| • Safe Transport of Radioactive Materials | Vangeline K. Parami Teresita G. de Jesus | Singapore | 5 - 16 Apr '04 | IAEA |
| • Role of Nuclear Power and Other Energy Options in Competitive Electricity Markets | Christina A. Petrache | Korea | 7 - 18 Jun '04 | IAEA |
| • Training Seminar on National Safeguards and the Additional Protocol | John M. Marquez | Australia | 7 - 25 Jun '04 | IAEA |
| • Radiation Protection in Industrial Radiography | Jocelyn L. David | Bangladesh | 16 - 20 Aug '04 | IAEA |
| • Quality Assurance System of Irradiation Facilities | Haydee M. Solomom | China | 23 - 27 Aug '04 | IAEA |
| • Authorization and Inspection of Radiation Sources in Nuclear Gauges and Well-Logging | Alan M. Borrás | Indonesia | 27 Sep - 1 Oct '04 | IAEA |
| • Prevention of Accidental Exposure in Radiotherapy | Thelma P. Artificio | Malaysia | 4 - 8 Oct '04 | IAEA |
| • Advanced Management Practices to be Applied by Nuclear Institutions | Graceta DL. Cuevas Victoria Fe O. Medina | Malaysia | 4 - 8 Oct '04 | IAEA |
| • Joint Training - Impact of Oil Spill on Marine Environment- Current Knowledge and Future Strategies | Elvira Z. Sombrito | Korea | 10 - 23 Oct '04 | AMETEC-PEMSEA |
| • Industrial Process Gamma Tomography | Michael Dennis T. Fernandez | Korea | 11 - 15 Oct '04 | IAEA |
| • Physical Protection of Nuclear Materials and Facilities | Jose Osroxzon L. Amparo | USA | 17 Oct - 5 Nov '04 | IAEA |
| • Optimisation of Industrial Processes Through Improved Off-Belt and On-Line Bulk Analysis of Materials by Using PGNA | Alvin I. Lagmay | China | 25 - 29 Oct '04 | IAEA |

| TABLE 8. PNRI MANPOWER DEVELOPMENT (FOREIGN) | | | | |
|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|---------------------|---------------------|------------------------------------------|
| FIELD | NAME | PLACE OF FELLOWSHIP | DATE | SPONSOR |
| • 8th Safeguards Training Course | Roberto N. Fontanilla | Japan | 29 Nov - 16 Dec '04 | MEXT |
| • Technical Training for National Data Center Technical Staff | Socrates Jose P. Cañete | Indonesia | 8 - 14 Dec '04 | CTBTO |
| WORKSHOP | | | | |
| • FNCA Workshop on Utilization of Research Reactors: Subworkshop on Technetium-99m Generator Technology | Elvira Z. Sombrito Flora L. Santos | Indonesia | 12 - 16 Jan '04 | MEXT |
| • FNCA Workshop on Utilization of Research Reactors: Subworkshop on Neutron Scattering Experiments | Virginia S. Calix | Indonesia | 12 - 16 Jan '04 | MEXT |
| • Preservation of Research Reactor in Shutdown State and Decommissioning | Leonardo S. Leopando Lopito A. Caluag Corazon M. Garcia Edgar G. Racho | Japan | 2 - 6 Feb '04 | IAEA IAEA IAEA (EBP) IAEA (EBP) |
| • Nuclear Safety Culture | Vangeline K. Parami | Korea | 9 - 13 Feb '04 | MEXT |
| • Review and Presentation of Analytical Results on Baseline and Alternative Scenarios of Electrical Power Generation Options | Teofilo V. Leonin, Jr | Vietnam | 9 - 13 Feb '04 | IAEA |
| • Global Practices in Nuclear Materials Accountancy, Control and Physical Protection | Julietta E. Seguis | Czech Republic | 7 - 11 Jun '04 | IAEA |
| • Regulatory Authority Information System (RAIS-3) | Eulinia M. Valdezco Carl M. Nohay | India | 26 - 30 Jul '04 | IAEA |
| • Field Testing and Curriculum Development Activity for OSI Continuation Phase Geophysical Techniques (Activity)??? | Rolando Y. Reyes | U.K. | 26 Jul-6 Aug '04 | CTBTO |
| • Education and Training in Nuclear Safety | Vangeline K. Parami Raquel E. Grijaldo | Japan | 30 Aug -3 Sep '04 | IAEA |
| • FNCA 2004 Workshop on Mutation Breeding | Avelina G. Lapade Adelaida Barrida | Indonesia | 30 Aug - 3 Sep '04 | MEXT |
| • FNCA 2004 Workshop on Application of Electronic Accelerator | Lucille V. Abad | China | 5 - 11 Sep '04 | MEXT |
| • Application of the Code of Conduct on the Safety of Research Reactors | Estelita Cabalfin Eulinia M. Valdezco | USA | 13 - 24 Sep '04 | IAEA |
| • FNCA 2004 Workshop on Radioactive Waste Management (Sub-Meeting on NORM/TENORM) | Teofilo Y. Garcia | Malaysia | 27 Sep - 1 Oct '04 | MEXT |
| • FNCA 2004 Workshop on Radioactive Waste Management | Edith A. Marcelo | Malaysia | 27 Sep - 17 Oct '04 | MEXT |
| • FNCA 2004 Workshop on Human Resource Development in the Nuclear Field | Estrella D. Relunia | Malaysia | 4 - 7 Oct '04 | MEXT |
| • Workshop on Regional Security of Radioactive Sources Project | Alumanda M. Dela Rosa Julieta E. Seguis | Australia | 10 Nov 04 | Australia |
| • First International Workshop on Nuclear Technology for Managers | Corazon C. Bernido | Korea | 9 - 18 Nov '04 | KAERI |
| • Thermal Hydraulic Safety Analysis of Research Reactors | Christina A. Petrache | Indonesia | 29 Nov - 10 Dec '04 | IAEA |
| • Thermal Hydraulics Safety Analysis for Research Reactors | Carl M. Nohay | Indonesia | 6 - 10 Dec '04 | IAEA |

| TABLE 8. PNRI MANPOWER DEVELOPMENT (FOREIGN) | | | | |
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| FIELD | NAME | PLACE OF FELLOWSHIP | DATE | SPONSOR |
| SEMINAR <ul style="list-style-type: none"> International Seminar on Nuclear Safety: Course on Operation and Maintenance of Nuclear Facilities Sub-Regional Seminar on Measures to Monitor, Detect, Identify and Respond to Incidents Involving Nuclear and Radioactive Materials International Seminar on Nuclear Security (For Managers and Decision Makers) International Seminar on Nuclear Safety - Safety Analysis Course Nuclear Safety: Course on Dissemination of Nuclear Knowledge | Luvimina G. Lanuza | Japan | 23 Aug - 3 Sep '04 | MEXT / RADA |
| | Julietta E. Seguis | Malaysia | 6 - 10 Sep '04 | IAEA |
| | Alumanda M dela Rosa | USA | 11 - 22 Oct '04 | IAEA |
| | Corazon M. Garcia | Japan | 8 - 19 Nov '04 | MEXT/RADA |
| | Rhodora R. Leonin | Japan | 13 - 22 Dec '04 | MEXT/RADA |
| | | | | |
| MEETING <ul style="list-style-type: none"> Asian Network for Education in Nuclear Technology (ANENT) 5th Coordinators Meeting: Forum for Nuclear Cooperation in Asia (FNCA) Meeting to Review Progress of the Project and Revise the Workplan (RAS/4/023) Final Project Review Meeting on External Dosimetry Intercomparison Meeting of the Steering Committee- Asian Nuclear Safety Network Technical Committee Meeting - Draft Action Plan for Strengthening the Infrastructural Preparedness and Response System for Nuclear and Radiological Emergencies 26th Meeting of National RCA Representatives ANSSN Thematic Group Meeting (spell out???) 12th Global Annual Meeting - Women in Nuclear (WIN) Information Technology Support Group Thematic Planning Meeting on Monitoring Pollution Meeting and Workshop - Selection Committee of the RCARO and Workshop for RCA Working-Level Staff Exchange of Experience Using the Cs-137 Technique for Measuring Soil Erosion Project Planning Meeting- Transfer of Receptor Binding Assay for Harmful Algal Toxins Dinoflagellate Cyst Mapping Project Coordination Meeting -Electronic Networking Outreach Strategic Planning for Developing Products and Services Using Nuclear Technologies Final Review Meeting on Restoration of Soil Fertility and Sustenance of Agricultural Productivity Meeting fop Senior Managers- Benefits and Safety in Radioisotope Techniques for Problem Solving in Petroleum/Chemical Industry | Corazon C. Bernido | Malaysia | 23 - 27 Feb '04 | IAEA |
| | Alumanda M. dela Rosa | Japan | 3 - 5 Mar '04 | MEXT |
| | Eduardo T. Cabildo | Bangladesh | 7 - 11 Mar '04 | IAEA |
| | Estrella S. Caseria | Japan | 15 - 19 Mar '04 | IAEA |
| | Corazon C. Bernido | China | 22 - 26 Mar '04 | IAEA |
| | Teofilo V. Leonin, Jr. | Austria | 5 - 8 Apr '04 | IAEA |
| | Alumanda M. dela Rosa | Pakistan | 12 - 15 Apr '04 | IAEA |
| | Carl M. Nohay | Korea | 20 - 23 Apr '04 | IAEA |
| | Rhodora R. Leonin | Japan | 17 - 22 May '04 | FNCA |
| | Angel B. Anden | Indonesia | 7 -10 Jun '04 | IAEA |
| | Flora L. Santos | Austria | 7 -11 Jun '04 | IAEA |
| | Corazon C. Bernido Nydia C. Medina | Korea | 13 - 17 Jun '04 | IAEA |
| | Elvira Z. Sombrito | Malaysia | 5 -9 Jul '04 | IAEA |
| | Elvira Z. Sombrito | Austria | 26 - 30 Jul '04 | IAEA |
| | Efren J. Sta. Maria | Japan | 21 - 27 Aug '04 | UNESCO/ IOC / WESTPAC |
| | Ana Elena L. Conjares | Korea | 23 - 27 Aug '04 | IAEA |
| | Charito T. Aranilla Alma S. Piñera | Austria | 24 - 27 Aug '04 | IAEA |
| | Faye G. Rivera | Thailand | 6 - 10 Sep '04 | IAEA |
| | Ma. Luz M. Ascaño | Malaysia | 9 - 17 Sep '04 | IAEA |
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| TABLE 8. PNRI MANPOWER DEVELOPMENT (FOREIGN) | | | | |
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| FIELD | NAME | PLACE OF FELLOWSHIP | DATE | SPONSOR |
| <ul style="list-style-type: none"> Final Project Review Meeting - Improving Animal Productivity and Reproductive Efficiency Final RCM - QA in Mass-reared and Released Fruit Flies for Use in SIT Programmes 1st RCM- Improving Sterile Male Performance in Fruit Fly SIT FNCA 2004 Project Leaders Meeting on Public Information of Nuclear Energy Project Progress Review Meeting on Multi-Location Trials and Enhancement of Genetic Diversity Meeting for Senior Managers - Optimization of Industrial Processes Using PGNAA Strategic Meeting - Nuclear Techniques for Rice Improvement in Asia Project Committee Meeting and Conference of Project Participants and End-Users Final Technical Meting- Review of Analytical Results of Country Studies (RAS/0/038) Final Project Meeting- Enhancing the Sustainability of the Marine Environment (Components 1 and 2) 5th FNCA Meeting - Forum for Nuclear Cooperation in Asia (FNCA) Regional Meeting -Development of National Nuclear Safety Education and Training Policy and Strategy RAS/8/091 (????) Technical Meeting to Review Progress and Future Activities of the EBP on the Safety of Nuclear Installations; Meeting of the Asian Nuclear Safety Network | Celia O. Asaad | Thailand | 11 - 15 Oct '04 | IAEA |
| | Sotero S. Resilva. | Mexico | 18 -22 Dec '04 | IAEA |
| | Glenda B. Obra | Guatemala | 25 - 29 Oct '04 | IAEA |
| | Rhodora R. Leonin | Thailand | 25 - 29 Oct '04 | MEXT |
| | Alfonso O. Grafia | Korea | 29 Oct - 3 Nov '04 | IAEA |
| | Silvestre I. Abaya | China | 1 - 3 Nov '04 | IAEA |
| | Adelaida C. Barrida | Japan | 4 - 7 Nov '04 | IAEA |
| | Flora L. Santos | Sri Lanka | 15 - 19 Nov '04 | IAEA |
| | Teofilo V. Leonin, Jr. | India | 16 - 20 Nov '04 | IAEA |
| | Teofilo Y. Garcia | Australia | 29 Nov - 3 Dec '04 | IAEA |
| | Alumanda M. dela Rosa | Vietnam | 30 Nov - 1 Dec '04 | MEXT |
| | Estrella D. Relunia | Pakistan | 6 - 10 Dec '04 | IAEA |
| | Silvestre L. Abaya | India | 6 - 10 Dec '04 | IAEA |
| | Corazon C. Bernido | Austria | 6 - 9 Dec '04 | IAEA |
| | | | | |
| | | | | |
| CONFERENCE/SYMPOSIUM/CONGRESS <ul style="list-style-type: none"> XV International Congress - Plant Protection 11th Congress - IRPA (spell out) 48th IAEA General Conference; 33rd RCA GC Meeting; Senior Regulators Meeting; RCARO Advisory Committee Meeting; Global Threat reduction Conference Asia Pacific Conference - Nuclear Safeguards and Security | Glenda B. Obra | China | 5 - 11 May '04 | IAEA |
| | Eulinia M. Valdezco | Spain | 23 - 28 May '04 | E.M. VALDEZCO |
| | Alumanda M. dela Rosa | Austria | 18 - 24 Sep '04 | IAEA |
| | Alumanda M. Dela Rosa Julietta E. Seguis | Australia | 8 - 9 Nov '04 | Australian Gov't |
| SCIENTIFIC VISIT/ CONSULTANCY MISSION <ul style="list-style-type: none"> Scientific Visit -Radioactive Waste Management Scientific Visit - Enhanced Sustainability and Self-Reliance of Nuclear Institutes National Consultancy Mission - 2005 - 2006 Technical Cooperation Project Requests Plant Breeding and Genetics | Elunia M. Valdezco | Slovakia & Czech Republic | 8 -19 Mar '04 | IAEA |
| | Teofilo Y. Garcia Alma S. Piñera | Indonesia | 19 - 23 Apr '04 | IAEA |
| | Alumanda M. dela Rosa | Austria | 2 - 5 Aug '04 | IAEA |
| | Alfonso O. Grafia | China and Japan | 15 - 26 Nov '04 | IAEA |
| RESEARCHERS EXCHANGE PROGRAM <ul style="list-style-type: none"> Creation of Functional Organic Thin Films Using Radiation Technique Small Angle Neutron Scattering on Nano-Structures of Soft Matter | Lorena A. del Castillo | Japan | 7 Sep - 3 Dec '04 | MEXT |
| | Lucille V. Abad | Japan | 28 Jul '03 - 24 Jul '04 | MEXT |

| TABLE 9. PNRI MANPOWER DEVELOPMENT (LOCAL) | | | |
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| FIELD | NAME | VENUE | DATE |
| TRAINING COURSE | | | |
| <ul style="list-style-type: none"> Toxic and Hazardous Waste Certificate Training Program | Editha A. Marcelo | Quezon City | 12-16 Jan; 23 -27 Feb; 26 Mar '04 |
| <ul style="list-style-type: none"> DOST Collaborative Software Development System Launching and User Training | Angel B. Anden | DOST | 11 Mar '04 |
| <ul style="list-style-type: none"> 3rd Advance Disaster Management Training Course | Eulinia M. Valdezco | MDC, Quezon City | 3 - 6 May '04 |
| <ul style="list-style-type: none"> National Training Course on the Implementation of the International Maritime Dangerous Goods (IMDG) Code | Alan M. Borrás, Rosita R. Daroy, Sylvia S. Busine, Teresita G. de Jesus | Manila | 23 - 26 Nov '04 |
| SEMINAR / WORKSHOP | | | |
| <ul style="list-style-type: none"> Life Cycle Assessment and Design for Environment Workshop | Estrella D. Relunia, Charito T. Aranilla | Makati City | 15 - 16 Jan '04 |
| <ul style="list-style-type: none"> Seminar-Workshop on Different Microscopy Techniques and Image Analysis Software | Ma. Lucia C. Cobar, Evelyn M. Tolentino, Joseph R. Tugo | FNRI, Taguig | 26 Mar '04 |
| <ul style="list-style-type: none"> BPI Workshop/Writeshop | Victoria Fe O. Medina, Glenda B. Obra | Los Banos, Laguna | 1- 2 Apr '04 |
| <ul style="list-style-type: none"> Inter-Agency Consultation/Workshop for the Framing of the National Critical Infrastructure Security Plan | Eulinia M. Valdezco | Tagaytay City | 18 - 20 Apr '04 |
| <ul style="list-style-type: none"> National Workshop on Design Basis Threat | Corazon C. Bernido, Eulinia M. Valdezco, Grace DL Cuevas, Virginia S. Calix, Estelita G. Caballin, Leonardo S. Leopando, Estrella S. Casería, Julieta E. Seguis, Randy V. Salazar, Jeofrey O. Tranquilan | PNRI | 27 - 29' Apr ' 04 |
| <ul style="list-style-type: none"> Sub-Technical Working Group Workshop for Integrated Environmental Monitoring Program (IEMP) -Manila Bay Environmental Management Project (MBEMP) | Elvira Z. Sombrito | Clarkfield, Pampanga | 7- 8 June '04 |
| <ul style="list-style-type: none"> Test Analysis and Calibration Information System for DOST (TACIS) SAD Workshop | Angel B. Anden | DOST | 31 Aug; 3 Sep; 4 & 8 Oct '04 |
| <ul style="list-style-type: none"> Two- Day Seminar on Economic Impact of Legal Protection of Intellectual Property Rights | Lucille V. Abad | Makati City | 13 -14 Oct. '04 |
| <ul style="list-style-type: none"> Final Project Workshop on Promotion of Cleaner Production | Estrella D. Relunia | Pasig City | 22 Nov '04 |
| MEETING/DIALOGUE | | | |
| <ul style="list-style-type: none"> Sweeping Off the Dust in Manila's Air. A Science and Policy Dialogue | Soledad S. Castañeda | ADB | 21 Apr ' 04 |
| <ul style="list-style-type: none"> General Assembly Meeting of SciNET Members | Isabel M. Amiscaray | STII - DOST | 25 Jun & 10 Dec '04 |
| SYMPOSIUM/FORUM | | | |
| <ul style="list-style-type: none"> Technical Forum on PCIERD: Forging Partnerships with SMEs | Christina A. Petrache, Rolando Y. Reyes, Flora L. Santos | Shangri-la Hotel | 18 Mar '04 |
| CONVENTION/CONGRESS/CONFERENCE | | | |
| <ul style="list-style-type: none"> 19th Philippine Chemistry Congress | Alumanda M. dela Rosa Sol?, Lorna?, Chat? | Iloilo City | 24-26 May '04 |
| <ul style="list-style-type: none"> 22nd Samahan Pisika ng Pilipinas (SPP) Physics Congress | Valerie Ann A. Innis, Jade R. Dungao | Bohol | 24 -27 Oct. '04 |
| <ul style="list-style-type: none"> 7th World Buffalo Congress | Celia O. Asaad, Azucena C. de Vera | Makati City | 20 - 24 Oct. '04 |
| <ul style="list-style-type: none"> Two- Day Conference on Institutionalization and Demonstration of ISO 9001: 2000 - Aligned Quality Management System (QMS) Towards Public Service Performance Excellence | Eulinia M. Valdezco | Pasig City | 16 -17 Nov '04 |

| TABLE 10. LIST OF TECHNICAL PAPERS | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PAPERS/REPORTS PUBLISHED AND PRESENTED | |
| PAPERS/REPORTS PUBLISHED | |
| Abad, Lucille V., I. Nasimova, Lorna S. Relleve, Charito T. Aranilla, Alumanda M. dela Rosa, and M. Shibayama. Dynamic Light Scattering Studies of Irradiated Kappa Carrageenan. Int. J. Biol Macromol, 34(2004), 81 - 88. | Rosales, Crispina M., Agustin R. Mercado, Jr., Charmaine Pailagao, Alfonso O. Grafia and Faye Rivera. Timber Tree-Based Contour Hedgerow System on Sloping Acid Upland Soils: The Use of 15N in Quantifying Tree-Crop Interaction in Agroforestry System. Philippines Nuclear Journal. 14 (2004) 26 - 39. |
| Asencion, Apolinar B., Avelina G. Lapade, Alfonso O. Grafia, Adelaida C. Barrida, Ana Maria .M. Veluz and Lucia J. Marbella. Induced Mutation for the Improvement of Soybean (Glycine max (L). Philippines Nuclear Journal, 14(2004), 12 - 25. | Sombrito Elvira Z., and Adelina M. Bulos. "Results of Performance Tests on Polymer Zirconium Compound (PZX). Proceedings of the 2003 Workshop on the Utilization of Research Reactors. 2004. |
| Caballin, Estelita G. Radiation Processing of Thin Films in the Philippines. Proceedings of the FNCA 2003 Workshop on Application of Electron Accelerator- Radiation System for Thin Film. Kuala. Lumpur, Malaysia, August 18 - 22, 2003, JAERI - Conf 2004 -007, June 2004. | Sombrito, Elvira Z., Adelina M. Bulos, E. F. Furio, Efren J. Sta. Maria, and Ma. Celestina B. Honrado. "Application of 210Pb - derived Sedimentation Rates and Dinoflagellate Cyst Analyses in Understanding Pyrodinium bahamense Harmful Algal Blooms in Manila Bay and Malampaya Sound, Philippines". Journal of Environmental Radioactivity. (2004) 177-194 |
| Conjares, Ana Elena L. Connection Configuration of PNRI's N137 Station (Short Communication). Philippines Nuclear Journal, 14 (2004), 68 - 72. | Hughes, C.E., P.L. Airey, E.B. Duran, B.M. Miller and Elvira Z. Sombrito. Using Radiotracer Techniques for Coastal Hydrodynamic Model. Journal of Environmental radioactivity, Vol. 76, November 1 - 2, 2004, pp195 - 206. |
| Del Castillo, Lorena A., Neil R. Guillermo and Virginia S. Calix. Observation of Magnetic Phase Transition in Mn-Doped Sm-Orthoferrite (SmFe1-XMnXO3). Philippines Nuclear Journal, 14 (2004), 48 - 53. | Technical Working Group for Refined Risk Assessment (TWG-RRR). "Manila Bay: Refined Risk Assessment" . PEMSEA Technical Report No. 9. Global Environmental Facility/United Nations Development Programme/International Maritime Organization Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), and Manila Bay Environmental management Project (MBEMP). Quezon City, Philippines, 2004, 169 pp. |
| Garcia, Teofilo Y., Eliza B. Enriquez, Fe M. dela Cruz, Preciosa B. Pabroa and Antonio Asada, Jr. Analysis of Cesium-137 and Stable Lead in Soil and Plant Samples Grown at the Former Ammunition Dump Area in Clark Special Economic Zone (Short Communication). Philippines Nuclear Journal, 14(2004), 89 -92. | PAPERS PRESENTED Abad, Lucille V., I. Nasimova, S. Koizume, and M. Shibayama. "Structure and Dynamics of Irradiated Kappa Carrageenan". Paper presented at the 53rd SPSJ Annual Meeting, Kobe International Conference Center, Kobe-shi, Japan, 25 - 27 May 2004. |
| Innis, Valerie, P.P. Saligan and V.S. Calix. "Using a Philips Powder Diffractometer for X-Ray Reflectivity". Proceedings of the 22nd Samahang Pisika ng Pilipinas (SPP) Physics Congress. Bohol Tropics Resort, Tagbilaran City, Bohol, Philippines, October 25 - 27, 2004. | Abad, Lucille V., Charito T. Aranilla, Lorna S. Relleve and Alumanda M. dela Rosa. "Radiation Processing of Carrageenan Using Electrom Beam". FNCA 2004 Workshop on Application of Electron Accelerator - EB Treatment of Flue Gases, Beijing, China. 6 - 10 September 2004. |
| Lapade, Avelina G., Adelaida C. Barrida, Ana Maria S. Veluz, Fernando B. Aurigue, Lucia J. Marbella and Manny G. Rama. The Effects of Gamma Irradiation on Cashew (Anarcadium occidentale L.) and Mangosteen (Gracinia mangostana). Philippines Nuclear Journal. 14 (2004), 1- 11. | Artificio, Thelma P. "Country Report on Safety in the Use of Radioactive Materials in the Philippines". Paper presented at the Regional Training Course on Prevention of Accidental Exposure in Radiotherapy. Kuala Lumpur, Malaysia, October 4 -8, 2004. |
| Natera, Erlinda S. Contents of Cesium, Iodine, Strontium, Thorium and Uranium in Selected Human Organs of Adult Asian Population. Health Physics - The Radiation Safety Journal , Volume 87, No. 2, August 2004. | Barrida, Adelaida C., Alfonso O. Grafia, Avelina G. Lapade, Apolinar B. Asencion and Eduardo C. Costimiano. "Status Report on the FNCA Multilateral Research Program (MRP-1) on Drought Tolerance of Soybean (Glycine max (L).Merr.) in the Philippines". Paper presented in the FNCA Workshop on Mutation Breeding held at Grand Mercure Hotel, Yogyakarta, Indonesia, 30 August to 3 September 2004. |
| Nazarea, Teresa Y., Alejandro Q. Nato, Jr., Eliza B. Enriquez, Lorna Jean H. Palad, Fe M. dela Cruz, Teofilo Y. Garcia, Antonio A. Asada and Maria Lucia C. Cobar. Radiological Surveillance of the Former U.S. Base: Poro Point, San Fernando City, La Union. Philippines Nuclear Journal. 14 (2004), 40- 47. | Barrida, Adelaida C., Apolinar B. Asencion, Alfonso O. Grafia, and Eduardo C. Costimiano. "Induced Mutations for Rice Improvement at Philippine Nuclear Research Institute". Paper presented at the FAO/IAES/RCA Strategic Meeting on "Nuclear Techniques for Rice Improvement in Asia". Tsukuba, Japan, 4 - 7 November 2004. |
| Olivares, Ryan U., T. Oda, Y. Oya, K. Tsuchiya and S. Tanaka. "Hydrogen Isotopes Behavior on Li2TiO3 under Deuterium Ion Irradiation and Water Exposure. Proceedings of the 23rd Symposium on Fusion Technology. Venice, Italy, September 2004. | Bernido, Corazon C., Nuclear Science and Technology in Higher Education in the Philippines presented at the Technical Meeting on the Asian Network for Education in Nuclear Technology (ANENT), Kuala Lumpur, Malaysia. February 23-27, 2004. |
| Olivares Ryan U. et al. Hydrogen Isotope Behavior on Li2TiO3 Under Water Exposure and Deuterium Ion Irradiation. Proceedings of the 12th International Workshop on Ceramic Breeder Blanket Interactions, Karlsruhe, Germany. September 15 - 17, 2004. | Bernido, Corazon C., Current Status of ANSN National Center in the Philippines presented at the Meeting of the Steering Committee of the Asian Nuclear Safety Network, Beijing, China, March 22-26, 2004. |
| Palad, Lormma Jean and Chang- Woo Lee. Analysis of Thorium Using Two Radiochemical Separation Techniques by Alpha Spectrometry (Short Communication. Philippines Nuclear Journal, 14(2004), 84 -88. | Bernido, Corazon C., Global Efforts for Sustainable Development presented at the Workshop for RCA Working Staff of Member States, Daejeon, Korea. June 14-17, 2004. |
| Relleve, Lorna S., N. Nagasawa, L. Luan, T. Yagi, Charito T. Aranilla, Lucille V. Abad, T. Kume, F. Yoshii, Alumanda M. dela Rosa. Degradation of Carrageenan by Low Energy Accelerator. Proceedings of the FNCA 2003 Workshop on Application of Electron Accelerator- Radiation System for Thin Films, Kuala Lumpur, Malaysia, JAERI-Conf 2004-007. | Bernido, Corazon C., Development of Nuclear Energy and Nuclear Legislation in the Philippines, presented at the 1st International Workshop on Nuclear Technology for Managers, 9-18 November, 2004 NTO/KAERI, Daejeon, Korea. |

| TABLE 10. LIST OF TECHNICAL PAPERS | |
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| PAPERS/REPORTS PUBLISHED AND PRESENTED | |
| PAPERS PRESENTED | |
| Caballin, Estelita G. "Prospects of Electron Beam Treatment of Flue Gases in the Philippines". Paper presented at the FNCA 2004 Workshop on Application of Electron Accelerator - EB Treatment of Flue Gases, Beijing, China, September 6 - 10, 2004. | Relleve, Lorna S., N. Nagasawa, L. Luan, T. Yagi, Charito T. Aranilla, Lucille V. Abad, T. Kume, F. Yoshii and Alumanda M. dela Rosa. Preparation of Carrageenan Oligomer by Radiation Degradation. Paper presented at the 19th Chemistry Congress, Sarabia Manor Hotel, Iloilo City, 24 - 26 May 2004. |
| Grafia, Alfonso O., A.E. Infortuno, J.P. Mendoza, J.A. Valdez, and W. Villasper. "Mutants Multi-location Trials in Mungbean (Vigna radiata (L.) Wilczek)." Paper presented in the IAEA/RCA Project Progress Review Meeting on "Mutants Multilocation Trials and Mutation Enhancement of Genetic Diversity". Suwon and Seoul, Republic of Korea, 28 October to 3 November 2004. | Solomon, Haydee M. "Process Control at the PNRI Multipurpose Irradiation Facility". Paper presented at the Regional Training Course on Quality Assurance System of Irradiation Facilities. Beijing, China, August 23 - 27, 2004. |
| Grafia, Alfonso O., A.E. Infortuno, J.P. Mendoza, J.A. Valdez, and W. Villasper. "Mutants Multi-location Trials in Groundnut (Arachis hypogaea L.). Paper presented in the IAEA/RCA Project Progress Review Meeting on "Mutants Multilocation Trials and Mutation Enhancement of Genetic Diversity". Suwon and Seoul, Republic of Korea, 28 October to 3 November 2004. | Sombrito, Elvira Z., Adelina M. Bulos, Richard M. Balog and Efren J. Sta Maria. "Soil Redistribution Studies Using Fallout 137Cs". Paper presented during the IAEA/RCA Meeting on Exchanging of Experiences Using 137Cs Technique for Measuring Soil Erosion/Sedimentation and Associated Pesticide Contamination (RAS/5/039-Part 2), MINT, Bangi, Malaysia, 5 - 9 July 2004. |
| Grafia, Alfonso O., A.E. Infortuno, J.P. Mendoza, J.A. Valdez, and W. Villasper. "Mutational Enhancement of Genetic Diversity in Mungbean and Groundnut". Paper presented in the IAEA/RCA Project Progress Review Meeting on "Mutants Multilocation Trials and Mutation Enhancement of Genetic Diversity". Suwon and Seoul, republic of Korea, 28 October to 3 November 2004. | Sombrito, Elvira Z. and Adelina M. Bulos. Results of Performance Tests on Polymer Zirconium Compound (PZC). Paper presented at the 2003 Workshop on the Utilization of Research Reactor. 2004. |
| Innis, Valerie Ann A., Pablo P. Saligan and Virginia S. Calix. "Using a Philips Powder Diffractometer for X-Ray Reflectivity". Paper presented during the 22nd Samahang Pisika ng Pilipinas (SPP) Physics Congress. Bohol Tropics Resort, Tagbilaran City, Bohol, Philippines, October 25 - 27, 2004. . | Sombrito, Elvira Z. Oil Pollution in Manila Bay, Philippines: "Impact of Oil on Marine Environment - Current Knowledge and Future Strategies". 2004 AMETEC/PEMSEA. Korea, October 10 - 23, 2004. |
| Lanuza, Luvimina G. "Operation and Maintenance of the PNRI Multipurpose Irradiation Facility". Paper presented at the International Seminar on Nuclear Safety 2004, Operation and Maintenance of Nuclear Facilities Course, Tokai, Japan, August 23 - September 3, 2004. | |
| Lanuza, Luvimina G. "Safety Training of PNRI Multipurpose Irradiation Facility Personnel". Paper presented during the International Seminar on Nuclear Safety 2004, Dissemination of Nuclear Knowledge Course, Tokai, Japan, August 23 - September 3, 2004. | |
| Leonin, Rhodora R. "Activities of the Philippine Nuclear Research Institute in Disseminating Nuclear Knowledge". Paper presented at the International Seminar on Nuclear Safety 2004, Course on Dissemination of Nuclear Knowledge, Tokai, Japan, December 13 - 22, 2004. | |
| Leonin, Teofilo, Jr. V. "The Role of Renewable Energy and Other Energy Options in Competitive Electricity Markets in the Philippines". Technical Report presented at the Philippine Case Study in the Final National Coordinators' Workshop, Mumbai, India, 16 November 2004. | |
| Natera, Erlinda S. "Occupational Exposure Among Radiation Workers". Paper presented at the 9th National Occupational Safety and Health Congress, Occupational Health and Safety, North Avenue, Quezon City, October 21 - 22, 2004. | |
| Natera, Erlinda S. "Radiation and its Peaceful Applications". Paper presented at the Annual Convention and Seminar of Philippine Organization of Science and Technology Educators, Southern Leyte State University, San Juan, Sourthern Leyte, September 23- 26, 2004. | |
| Olivares, Ryan U. et al. "Hydrogen Isotope Behavior on Li2TiO3 Under Water Exposure and Deuterium Ion Irradiation. Paper presented at the 12th Ceramic Breeder Blanket Interactions, Karlsruhe, Germany, September 15 - 17, 2004. | |
| Olivares, Ryan U. (Co-author) " Hydrogen Isotope Behavior on Lithium Titanate". Paper presented at the 11th Annual Convention for Nuclear Students. The University of Tokyo, March 16 - 20, 2004. | |
| Olivares, Ryan U., T. Oda, Y. Oya, K. Tsuchiya and S. Tanaka. "Hydrogen Isotope Behavior on L12TiO3 under Deuterium Ion Irradiation and Water Exposure. Paper presented at the 23rd Symposium on Fusion Technology. Venice, Italy, September 2004. | |
| Parami, Vangeline, K. "Proposal for Radiation Safety Culture and Progress Report on Nuclear Safety Culture Activities in the Philippines". Paper presented during the FNCA Workshop on Nuclear Safety Culture. Daejon, Korea, February 9 - 13, 2004. | |

| TABLE. LIST OF TECHNICAL POSTER PRESENTATIONS | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------|
| Abad, Lucille V., I. Nasimova, M. Shibayama. "Dynamic Light Scattering of Irradiated Kappa Carrageenan". Technical poster presented during the 19th Chemistry Congress, Sarabia Manor Hotel, Iloilo City, May .24 -26, 2004. | | |
| Olivares, Ryan U. et al. "Hydrogen Isotope Behavior on L12TiO3 under Varied Surface Condition". Technical poster presented during the 23rd Symposium on Fusion Technology, Venice Italy, September 20 - 24, 2004. | | |
| Olivares, Ryan U. (Co author). "Thermal Desorption Behaviour of Hydrogen Isotopes Interacting with Defect in Lithium Oxide. Technical poster presented at the "23rd Symposium on Fusion Technology, Venice, Italy, September 20 -24, 2004. | | |
| LIST OF ABBREVIATIONS | | |
| CTBTO | - | Comprehensive Test Ban Treaty Organization |
| DOST | - | Department of Science and Technology |
| EBP | - | Extrabudgetary Programme |
| FNCA | - | Forum for Nuclear Cooperation in Asia |
| IMO | - | International Maritime Office |
| IAEA | - | International Atomic Energy Agency |
| INIS | - | International Nuclear Information System |
| KAERI | - | Korea Atomic Energy Research Institute |
| KOICA | - | Korean International Cooperation Agency |
| MEXT | - | Ministry of Education, Culture, Sports and Science and Technology, Japan |
| RADA | - | Radiation Application Development Association |
| RCA | - | Regional Co-operation Agreement for Research and Development and Training Related to Nuclear Science and Technology for Asia and the Pacific |
| UNESCO/IOC/WESTPAC | - | ???? |

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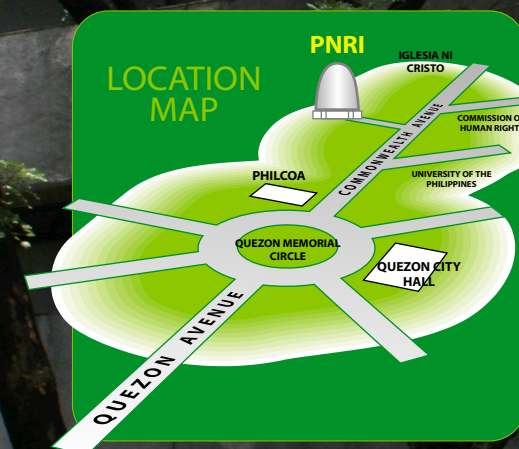


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