



Department of Science and Technology

2009
PHILIPPINE NUCLEAR ANNUAL
RESEARCH INSTITUTE REPORT

About Us

The Philippine Nuclear Research (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 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.

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.”



Message from the Director

After celebrating the productive milestones in the 50 years of its existence last year, the Philippine Nuclear Research Institute (PNRI) starts its journey for the next 50 years serving the Filipino people with the goal of contributing to an S & T-based economy for the country. The PNRI is committed to attaining this goal through its dual mandate of promoting the peaceful applications of nuclear energy and regulating their safe and secure utilization.

On behalf of the officials, scientists and staff of the PNRI, I have the honor to present the PNRI Annual Report for 2009. The Report reflects the collective efforts of the PNRI staff as they strive to be relevant and responsive to the needs of clients and stakeholders. I would like to

highlight our accomplishments in the industrial applications of nuclear energy without diminishing the impact of the other accomplishments described in this Report.

The PNRI has completed the upgrade of the Multipurpose Irradiation Facility (MIF) enabling it to irradiate four times the volume of products per batch at shorter irradiation times. Thus, the queue for irradiation services has been shortened if not

eliminated, and the PNRI can now accommodate all requests for irradiation services. The upgraded MIF serves as a demonstration facility for the local industries to assess the potential contribution of radiation technology in their processes and operations. Likewise, the PNRI Radioanalytical Laboratory was awarded ISO 17025:2005 accreditation by the Philippine Accreditation Office for the gammametric analysis of food and related items, and gross alpha-beta analysis of water. The local industries avail of these analyses to meet the export requirements for their products and the requirements of the Department of Health for local distribution of drinking water. This stamp of quality adds value and confidence to the certificates of radiometric analyses of Philippine products.

PNRI employed radiation technology to solve the problem of American Foul Brood (AFB), an infectious disease of honey bee that poses a threat to the local

beekeeping industry. The PNRI has established the radiation dose that effectively sterilizes the AFB-infected materials such as hives and frames, and is recommending gamma irradiation for routine disinfection/sterilization of new and used apicultural equipment to prevent and/or control the spread of AFB in various apiary sites in the country.

Our mutation breeding work on ornamentals is providing our ornamental growers and the ornamental industry with new varieties of plants. In 2009, PNRI had registered a new variety with the National Seed Industry Council (NSIC) bringing to six the number of mutant ornamental plants approved by the NSIC. The new variety is *Cordyline 'Afable'*, a chlorophyll mutant of *Cordyline 'Kiwi'*.

For the mining industry, a radiometric-based exploration technique for mineral prospecting has been successfully validated with known copper-gold deposits in the country. The combination of potassium and potassium/thorium highs are the radiometric indicators in the exploration of porphyry copper-gold deposition. The results of our investigation showed that the gamma ray technique can be a useful tool in the search for porphyry copper-gold deposits in the country.

The PNRI is participating in the activities of the DOE-DOST Core Group on Nuclear Energy specifically in addressing the 19 infrastructure components for launching a nuclear power program. Guided by its mandate as the nuclear regulatory body to ensure nuclear safety in nuclear facilities, the PNRI has undertaken initial activities on strengthening the legislative and regulatory infrastructure for nuclear power, on establishing the regulatory framework for the licensing of nuclear facilities, and on human resources development both for the regulatory staff and the prospective utility. PNRI has participated in the formulation of a public perception survey on nuclear energy for power generation. Results of the survey will be used in the development of a communication plan aimed at empowering the public to have an informed decision on nuclear power.

I wish to express the Institute's gratitude to the Department of Science and Technology, its Member Agencies and Regional Offices, to our donors, cooperators and partners, and to the International Atomic Energy Agency (IAEA) for their invaluable support. I thank all PNRI scientists and staff for the commitment and dedication you have again demonstrated to enable PNRI fulfil its task in bringing the benefits of nuclear energy to the Filipino people.



ALUMANDA M. DELA ROSA, Ph.D.
Director



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Diffusion of Knowledge and Technologies

To increase awareness and understanding of stakeholders and the public on the various aspects of nuclear science and technology, the PNRI pursued the conduct of its nuclear training program and the implementation of its information, education and communication program, among others.

NUCLEAR TRAINING

A total of 869 professionals and technicians from private and government institutions/agencies participated in the 40 training courses conducted by the PNRI's Nuclear Training Center (NTC). These courses included the following: nuclear science for high school and college teachers; radiation safety; radioisotope techniques in the medical field; nuclear power; nondestructive testing (NDT) techniques, and on welding inspection. The NDT and welding inspection courses were conducted in cooperation with the Philippine Society for Nondestructive Testing, Inc. (PSNT). (See Appendices, Table I on page 34 for list of training courses).

As part of the Institute's training program for high school, undergraduate and graduate students, the NTC arranged on-the-job training for 64 high school and college students in different facilities and laboratories of the Institute. Thesis advisorship was likewise arranged for five students from two universities. (See Appendices, Tables 2 and 3 on page 35).

LIBRARY SERVICES

The PNRI Library Services Group provided assistance to around 2,630 clients composed mostly of students. The Library acquired 470 volumes of books, journals and other publications through exchange and donation from





Nuclear awareness seminar at PNRI

local and foreign institutions/ organizations. To enhance support to the research requirements of its clients, the Group continued its active participation in the following:

- International Nuclear Information (INIS) System which operates under the International Atomic Energy Agency. The INIS database contains three million bibliographic references on nuclear science and technology (<http://www.iaea.org/inisnkm>);
- Science and Technology Information Network of the Philippines, designed to automate all major tasks of the library for on-line public access (OPAC) of the DOST System (www.scinet.dost.gov.ph);
- Philippine e-Library project (<http://www.elib.gov.ph>).

INFORMATION SERVICES

PNRI's Information Services Group has been undertaking various information, education and communication activities to increase public awareness and understanding of stakeholders on nuclear science and technology and its applications.

Development of information materials

The Information Services Group developed a new video presentation featuring PNRI's research, service and regulatory activities entitled "Making Nuclear Technology Work for Filipinos". This institutional video is being shown to nuclear training course participants, and various groups of PNRI visitors during their educational tour.

Brochures on PNRI nuclear services and nuclear technology applications were updated. More than 27,000

copies of the brochures were distributed to around 10,000 clients.

The PNRI also produced exhibit materials in the form of banners/posters on PNRI technologies and nuclear services which were exhibited during national events such as the annual DOST Science and Technology Fair. The banners/posters were produced with partial financial assistance from the Technology Application and Promotion Institute. (TAPI).

Educational Tours and Nuclear Awareness Seminars

Around 4,100 visitors, composed mostly of students, availed of the lectures, video showings and guided tours of PNRI facilities. These activities were carried by the PNRI Information Group in coordination with the PNRI technical groups.

A total of 942 students, teachers and other professional groups from 12 institutions were likewise provided with information on nuclear science and technology through 21 nuclear awareness seminars conducted by the Information Services Group in coordination with the Nuclear Training staff and PNRI technical staff.

Nuclear S and T Promotion Through Media Linkages

The public was informed about the research, service and regulatory activities of PNRI through six news releases and 11 radio/television interviews of PNRI officials and technical staff. The topics that were featured in the media were the following: • Regulatory aspects regarding nuclear power; • activities for the Quezon City Science Community celebration of the National Science and Technology

S & T EVENT	DATE	VENUE
Quezon City Science Community celebration of the National Science and Technology Week (exhibits and open house)	July 21-24	Quezon City
Visayas Cluster Science & Technology (S & T) Fair	August 3-7	Tacloban City, Leyte
Visayas Cluster S & T Fair	August 17-21	Bacolod City, Negros Occidental
Minadanao Cluster S & T Fair	September 14-18	Butuan City, Agusan del Norte
Minadanao Cluster S & T Fair	September 23-27	Davao City, Davao del Sur
Southern Luzon S & T Fair	November 9-13 November 25-29	Sta. Rosa, Laguna Naga City, Camarines Sur
Northern Luzon Cluster S & T Fair	December 2009	Rosales, Pangasinan
FNCA Public Information Seminar on Nuclear Energy	December 9	PNRI
37th Atomic Energy Week celebration	December 7-11	PNRI

Week; • PVP –carageenan hydrogel treatment; • irradiation as a phytosanitary treatment for food products; • activities of the Forum for Nuclear Cooperation in Asia; • PNRI projects; and • the 37th Atomic Energy Week celebration.

Participation in S & T Events

Information on the applications of nuclear science and technology as well as its services were provided to around 8,000 clients through ten national/ regional events participated in by the PNRI. The participation of PNRI in science and technology fairs has brought the institute closer to potential end-users. (See table above.)

NUCLEAR SAFETY CARAVAN

Through the DOST-GIA funded Nuclear Safety Caravan Project, the PNRI's Nuclear Regulations, Licensing and Safeguards Division conducted nuclear and radiation safety awareness seminars for 500 non-radiation workers and 70 percent of PNRI licensees operating outside Metro Manila.

The seminars were conducted in the following regions of the country:

- Region 3 (Olongapo City and Angeles City)
- Region 2 (Gattaran, Cagayan Valley); and
- Region 10 (Carmen, Cagayan de Oro City).

These seminars were conducted to inform and train PNRI licensees on safety and security measures that they should implement/enhance to ensure the health, safety and security requirements in their particular facility. Nuclear awareness seminars were also conducted for other stakeholders such as the local government units and the academe to increase their knowledge and understanding on the various aspects of radiation, nuclear science and technology and radioactive waste safety.



PNRI won as "Best Exhibit Booth" during the Visayas Cluster S & T Fair in Bacolod City.



As part of the program of the FNCA Public Information Project Leaders Meeting, a public information seminar was held at PNRI which was attended by around 100 participants.



A PNRI nuclear regulatory staff demonstrates the use of radiation detection instruments during a nuclear and radiation safety awareness seminar.

Interview of PNRI Director Alumanda M. Dela Rosa at UNTV on PNRI projects and services

Generation of New Knowledge and Technologies

BASIC RESEARCH

UPTAKE AND RELEASE OF TOXINS IN GREEN BAY MUSSEL

The Chemistry Research Group further studied the uptake and depuration kinetics of paralytic shellfish toxins (PSTs) in green mussels, *Perna viridis*, in field and laboratory conditions. The study involved the measurement of cell density and cell toxicity using a radioassay method (receptor binding assay) and a chemical method (High Performance Liquid Chromatography). The study sites are in Juag Lagoon which experiences recurring natural blooms of *Pyrodinium bahamense var. compressum* (PbC) and in Sorsogon Bay. PbC is an organism that causes paralytic shellfish poisoning (PSP).

Results of the studies showed that

- the environmental/physical factors may indirectly affect the accumulation and depuration kinetics through PbC bloom dynamics and accessibility of PbC as food for the mussel;
- an increase in cell density in the water column enhances the accumulation of the toxin;
- at low PbC concentration, the mussel toxicity increases slowly but may still exceed the regulatory limit in a short time;
- biotransformation of PSTs in PbC cell and in mussel contributes to the observed trend though at a lower extent compared to the cell density in the water column and the uptake rate of saxitoxins (STX) in mussel;
- at low cell density, the saxitoxin analog predominated, and thus at low PbC cell density, the mussel may exhibit high toxicity due to the predominance of STX analog, the most toxic among the analogs.



RADIATION PROCESSING OF NATURAL POLYMERS FOR AGRICULTURAL APPLICATIONS

The Chemistry Research Group continued to evaluate the properties of carrageenan for its potential as plant growth promoter.

This year, the investigation on the antioxidant property of kappa-carrageenan samples (fresh seaweed, dried seaweed, commercial grade) showed that kappa-carrageenan had different degrees of hydroxyl radical scavenging properties and reducing power. The fresh seaweed extracts showed higher scavenging activity compared to the dried seaweed and commercial grade carrageenans. Hydroxyl radical scavenging activity of carrageenan can be partially attributed to its metal chelating ability. The reducing capacity is generally associated with the presence of reducing sugars and might be due to hydrogen-donating ability.

Inter-Lab Determination of Chitosan Molecular Weight

Under the IAEA/CRP project on "Development of Radiation-Processed Products of Natural Polymers for Application in Agriculture, Healthcare, Industry and Environment", the Philippines through PNRI, participated in the inter-laboratory harmonization procedure for the molecular weight determination of chitosan using intrinsic viscosity measurement. The obtained molecular weight for the non-irradiated chitosan was close to the median (357-362 kDa) of seven participating countries.

HIGH TECHNOLOGY MATERIALS DEVELOPMENT

The Applied Physics Research Group (APRG) continued the research study on the metal adsorption properties of advanced materials such as bare quartz glass for novel applications in trace analysis. The x-ray spectroscopic techniques were used by APRG research specialists for this study.

The results indicated a more precise determination of the adsorption pH-edge for some heavy metals on silica. The rough estimates of the pH-edge for calcium and potassium were obtained. It was further confirmed that charge reversal occurs in heavy metal ion adsorption on silica above the pH-edge. It has also been shown that by using long adsorption time, it is possible to detect heavy metal ions below one ppb.



Quartz disc preparation for research study on metal adsorption properties of advanced materials

NUCLEAR APPLICATIONS IN FOOD AND AGRICULTURE

CROP IMPROVEMENT THROUGH RADIATION-INDUCED MUTATION

Rice

PNRI uses radiation-induced mutation to develop rice mutants with desirable agronomic characteristics and improved grain quality such as increased protein and low to intermediate amylose content. Rice with low to intermediate amylose content is preferred by Filipino consumers.

The rice mutants previously developed by PNRI, namely, PARC-2, Bengawan, Denorado, Milagroa,



Mutant rice varieties developed by PNRI are propagated in San Ildefonso, Bulacan for distribution to interested rice growers.

and Azucena were propagated at Bulacan Agricultural State College in San Ildefonso, Bulacan through the PNRI Grants-in-Aid Program. The propagated seeds were made available for distribution to interested rice growers. Seeds of PARC-2 and Bengawan mutants have been distributed to five farmers and rice growers in the provinces of Tarlac, Isabela and Negros Occidental for seed multiplication for the year.

The Agricultural Research Group also analyzed the protein content of around 49 putative mutant lines from the fourth generation (M4) of IR-72 which was previously irradiated with 200 gray (Gy) and 300 Gy gamma radiation. Results showed that the protein content of these seeds are within the intermediate level (6.03 to 10.62 percent). The percentage protein content of the control variety (IR 72) ranged from 6.06 to 7.31 percent while that of the check variety (IR 64) ranged from 9.19 to 9.94 percent.

Soybean

The seeds of the seventh generation (M7) of soybean varieties obtained from Vietnam (AKO-6, DT-5 and DT-84) and the eighth generation (M8) of selected drought tolerant mutant lines of three Philippine varieties (PSB-Sy 4, PSB-Sy5 and BPI-Sy 4) were planted at the PNRI experimental field for further selection, evaluation and seed multiplication.

Highly significant results were obtained on plant height at maturity and on weight of 100 seeds in the 9th generation (M9) of the Philippine soybean varieties.

Mungbean

To further evaluate and determine the effects of controlled irrigation to the yield and agronomic traits of mungbean, PNRI planted another batch of five promising mungbean genotypes (KPS2, Psj-S-3I, Ps-B-II-I7-6, and VCI973A and VC2917A) at the experimental area of the Bureau of Plant Industry in Los Baños, Laguna. A recommended variety, NSIC Mg-II, was also planted as control to compare their overall performance in the test. For this batch, the mungbean varieties were subjected to water stress by stopping the water supply at various intervals from three, four and five weeks after planting.

Preliminary results showed that KPS 2 variety is the most tolerant to drought since it had the highest yield even when irrigation was stopped five weeks after planting. This variety had a mean yield of 1466.7 tons per hectare. NSIC Mg II, the check variety, had a mean yield of 1299.2 tons per hectare.

This year, another batch of mungbean varieties which were exposed to several doses of gamma radiation (200, 400, 600 and 800 Gy) were planted at the same site in Laguna. Results showed that the five varieties had high yields and promising performance in multiplication trials. Starting in the third generation (M3), high yielding mutant lines with high protein and other nutrient contents will be selected from these varieties.

Cashew and Mangosteen

PNRI pursued its mutation breeding studies with cashew and mangosteen to develop new varieties of these high value crops with increased yield, improved quality of fruits, short stature (dwarf) to facilitate harvesting, with early maturity and non seasonal fruit production.

Cashew – The following results were obtained from the 50 irradiated and control plants maintained in the field at the PNRI compound:

- irradiated plants flowered two weeks earlier than the control plants;
- the plants treated with 100 Gy had the highest number of fruits harvested this year with an average number of 12 fruits per plant. The average number of fruits harvested for the control was only five fruits;
- the control plants had the biggest fruit with mean weight of 174.76 grams;
- among the irradiated population, plants treated with 100 gray produced the biggest fruits with mean weight of 108.2 gms; and
- the sweetest fruits were those harvested from plants irradiated with 400 Gy.

Molecular marker biotechnology is also being established in irradiated cashew using leaf samples from the second generation (M2) plants irradiated with 100 and 400 Gy. Using the protocol established for molecular markers in irradiated plants, a good amount of quality DNA was extracted. Further evaluation using different markers will be done for characterization and determination of point mutation.

Mangosteen – The planting materials of mangosteen can be increased using tissue culture technique.

Results of tissue culture experiments in mangosteen indicated that half-strength Murashige and Skoog (MS) basal medium produced more complete plantlets. For shoot formation, full-strength MS basal medium showed promising results. Confirmatory experiments will be done for this study as soon as large quantities of mangosteen fruits are available for tissue culture.

The PNRI provided on-the-job training on plant tissue culture

technique for mangosteen to the municipal agriculturist of Lucban, Quezon, who is one of PNRI's collaborators in mutation breeding project in mangosteen. The tissue culture technique will be adopted in the municipality of Lucban for multiplication of mangosteen plants.

Ornamentals

Foliage Ornamentals – *Cordyline 'Afable'*, a new and improved variety of Ti plant developed by PNRI through gamma irradiation technology, was registered with the National Seed Industry Council (NSIC) as NSIC 2009 Or-83 on November 25, 2009. Compared to the original variety, this chlorophyll mutant of *Cordyline 'Kiwi'* has field resistance to *Phytophthora sp.*, a rot-causing fungus.

The three mutant varieties of foliage ornamentals approved by NSIC in previous years, namely: *Murraya 'Ibarra Santos'*, *Dracaena 'Marea'* and *Cordyline 'Medina'*, were continuously propagated at PNRI and were commercialized. Meanwhile, the mutant varieties *Sansevieria trifasciata 'Sword of Ibe'* and *Freycinetia multiflora 'Golden Stairs'*, which were registered with NSIC in 2008, were propagated and exhibited for commercialization during the Atomic Energy Week celebration in December.

For this year, two mutant Red ginger (*Alpinia purpurata*) plants were obtained by gamma irradiation of the bulbs at 10 Gy. These mutants are : • the semi-dwarf mutant with shorter but stouter leaves compared with the control and produces bracts without flowers, and • the semi-dwarf mutant with smaller leaves compared with the control and cigar-shaped inflorescences.



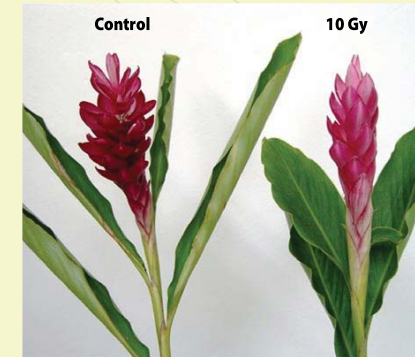
Cashew plants treated with 100 Gy gamma radiation had the highest number of fruits harvested in 2009.



Tissue culture is being used to increase mangosteen planting materials.



Cordyline frutescens 'Afable'



Alpinia purpurata



Putative mutant *Scadoxus multiflorus*

Cutflowers – New batch of chrysanthemum (MIV10) composed of 137 plants propagated by stem cuttings were transplanted in individual pots and in the field. Results of irradiation studies on the previous batch were : • plants irradiated with 10 Gy had the shortest stature (85.87 cm) while the control plants were the tallest (98.27); • the control plants had the most number of branching (seven branches) while the plants irradiated at 20 Gy had the least number of branching (five branches); • plants treated with 10 Gy had flowers with the biggest diameter; and • flowers from plants treated with 10 Gy had the longest vase life.

Putative Mutants of Other Ornamentals Plants

Five putative mutant plants were selected for advancement of the vegetative generation (V). These are: • *Acalypha* 'Brownie' with enlarged leaf of different shape and color compared with the control from V2 to V6; • *Dracaena sanderana* var. *virescens* chlorophyll mutant from V1 to V6; • Bagauak na Puti/ltim (*Clerodendrum calamitosum*) that is semi-dwarf and bears flowers both at shoot terminal and leaf axils from V1 to V6; • Galamay-Amo or Five Fingers (*Schefflera* sp.) from Batangas with variegated leaves from V1 to V5; and • Powder Puff (*Scadoxus multiflorus*) with variegated leaves from V1 to V2.

Varietal Improvement of Selected Ornamental Crops

A *Spathoglottis* plant of a PNRI project cooperator, which was discovered to be erroneously identified and labeled as *Spathoglottis chrysantha* in the book *Orhidiana Philippiniana* (Valmayor, 1984), has been renamed as *Spathoglottis* 'Helen L. Valmayor'.

This plant is the clone of a natural hybrid discovered a long time ago and propagated vegetatively by division. A plant selected from the selfed progenies of *Spathoglottis* 'Helen L. Valmayor' has been named *Spathoglottis* 'Estrella F. Alabastro'.

Putative mutants of foliage-type anthuriums and hoyas were obtained and evaluated for generation advancement. The putative anthurium mutant *A. gracile*, which is a self-pollinating species is going to third planting generation (M3), while *A. bakeri*, another self-pollinated anthurium, is going to the second planting generation (M2).

The PNRI germplasm collection has 95 living accessions composed of 51 known native species of *Hoya* including the unknown species and 16 imported species, varieties and mutants.

Asexually propagated crops Pineapple

The tissue culture technique for pineapple Queen variety, as well as the use of axillary bud as a means of propagation, has been successfully developed at PNRI. The technique is now being used in developing pineapple mutants that have either reduced spines in the leaves, increased size and vigor of the plant or induced properties suitable for the use of pineapple as ornamental plant.

Fifty- four irradiated pineapple plants and 20 control plants are also being maintained in the field. Most of the control and 20 Gy plants bear fruits and few were harvested from 30 Gy plants.

Orchids

For the White sanggumay (*Dendrobium anosmum* var. *dearei*), only plants obtained from the control protocorms and those treated with 10 Gy of acute gamma radiation survived three years after potting. For Waling-waling (*Euanthe sanderana*), some of the seedlings grown from protocorms subjected to 10 Gy were more vigorous than the control seedlings. Seedling mortality increased, while shoot and root growth decreased as the dose level was increased up to 60 Gy. Control Cattleya orchids cultured *in vitro* produced different colored flowers. Pollination of these flowers was done to produce embryo for irradiation.

QUARANTINE TREATMENT OF MANGO PULP WEEVIL IN PHILIPPINE CARABAO MANGOES

The PNRI used gamma irradiation as a treatment method in its research studies on the prevention of reproduction of the mango pulp weevil. These studies are in collaboration with the Department of Agriculture Region IV-B. The irradiation dose for the quarantine treatment of mango pulp weevil (MPW) in Philippine carabao mango has been established where the radiosensitivity of the different stages of MPW was determined. The pupae were found to be the least tolerant to radiation followed by the larvae while the adult stage was found to be the most tolerant to radiation based on the dose-response tests.

Data for the small scale confirmatory tests of the dose effectivity in preventing reproduction, egg hatchability and reaching adulthood were collected and analyzed. None of the radiation-

treated weevils laid eggs with less than 10 percent of the irradiated insects remaining. In the control, the number of remaining live adults ranged from 30 to 81 percent from three replicates while the average eggs laid ranged from 375.8 to 509.4 per female per day. Egg hatchability ranged from 96.4 to 97.3 percent.

ASSESSMENT OF SOIL REDISTRIBUTION AFTER EXTREME EVENTS

This research project aims to produce reliable and useful erosion/sedimentation rates data on selected critical watersheds identified by the Department of Environment and Natural Resources using fall-out radionuclides with the combined use of cesium-137 and beryllium-7. The study site was on a field where conservation measures were done such as use of vegetative hedges. The hedges were constructed only in the early part of 2008. Soil samples were also collected on an adjacent field with the same topography and land use but without vegetative hedges.

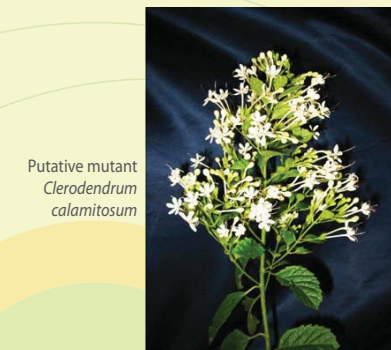
With the use of cesium-137 and beryllium-7 techniques, erosion rates obtained showed that the erosion rate (30 tons/ha/yr) in the field without the hedges is more than twice that of the field with hedges (11 tons/ha/yr). The average reference value of 206 Bq/m² was used in the calculation of soil redistribution rates. The value obtained is comparable to the beryllium-7 reference activity obtained in studies done in Spain which range from 20 to 170.3 Bq/m².



Shipment of mangoes from Palawan infested with pulp weevil for confirmatory trials at PNRI



A study area on soil erosion



Putative mutant *Clerodendrum calamitosum*



Spathoglottis 'Helen L. Valmayor'

Spathoglottis 'Estrella F. Alabastro'

RADIATION TECHNOLOGY AND PROCESSING

SEMI-COMMERCIAL PRODUCTION OF PVP-CARRAGEENAN HYDROGEL FOR WOUND DRESSING AND BEDSORE



Semi-commercial production of PVP-carrageenan hydrogel dressing developed by PNRI

The production of polyvinyl pyrrolidone (PVP)-carrageenan hydrogel for wound and burn dressing is now in its pilot scale. This dressing is intended to cover a wound, to absorb wound exudates, to control bleeding or fluid loss, and to protect against abrasion, friction, desiccation, and contamination. Gamma irradiation is used for polymerization and sterilization of the hydrogel dressing, which is made of hydrophilic polymers and carrageenan in combination with water.

Phase I of this project involved the construction of the pilot plant and the procurement of equipment, which have already been accomplished. Phase 2 was started in 2008. The second phase involved the semi-commercial production of hydrogels, clinical studies and market acceptability studies to be conducted by Biotecos Company, a private cooperating agency which signified interest in the commercialization of the product.

Phase 2 of the project was a follow through of the technology transfer process for the PVP-carrageenan hydrogel product in partnership with Biotecos, Inc. The manufacturing process for the hydrogel has been established. The standard physico-mechanical properties, such as gel strength, gel fraction and degree of swelling have also been established. Based on initial stability test results, these

physico-mechanical properties are still stable for a period of one year. The bioburden tests revealed that hydrogels have to be irradiated within 24 hours to ensure sterility of the products. On Biotecos, Inc.'s part, six trial centers have been established in northern Luzon where they conducted clinical trials.

PNRI and Biotecos conducted meetings with the Bureau of Food and Drugs (BFAD) to gather the requirements for a License to Operate before product registration of "Skin-Up" Hydrogel. PNRI and Biotecos also conducted meetings with Lloyd Laboratories, Inc. to comply with the BFAD requirement on conducting the production of the hydrogels in an environmentally "Clean Setting" - BFAD approved semi-controlled sterile area (Class 100,000).

ENVIRONMENTAL PROTECTION AND MANAGEMENT

MARINE RADIOACTIVITY MONITORING PROGRAM

This project is being undertaken to develop and strengthen the marine radioactivity monitoring program in the Philippines.

The PNRI has collected seawater, sediments and marine biota from the different sampling areas along the South China Sea. These areas are: Ilocos Norte, Zambales, Batangas, Palawan, Manila Bay, Leyte and Bataan. PNRI is also currently participating in the IAEA/RCA RAS/07/OI6 project entitled "Establishing a Benchmark for Assessing the Radiological Impact of Nuclear Power Plant on the Marine Environment in the Asia-Pacific Region".

The specific activity concentrations of key anthropogenic radionuclide cesium-137 and naturally-occurring radionuclides potassium-40, radium-226 and thorium-232 in sediment and biota were measured using a High Purity Germanium detector. The specific activity concentrations of naturally-occurring radionuclides polonium-210 in seawater, sediment and biota were determined using radiochemical procedures and measured by alpha spectrometry.

A total of 17 marine samples were analyzed for polonium-210. Preliminary evaluation of the results indicates that the concentrations of polonium-210 are within normal levels.

ASSESSMENT OF NATURALLY-OCCURRING RADIOACTIVE MATERIALS (NORM)

A research contract entitled "Commission Work for Collection and Collaborative Analysis of NORM Used as Industrial Material" was entered into by PNRI with the National Institute of Radiological Sciences (NIRS), Japan. The purpose of the contract is to collect NORM used as industrial materials and to analyze them collaboratively.

Two industrial plants which used NORM as raw materials were selected as sampling locations, namely: Pagbilao coal-fired power plant in Pagbilao, Quezon and PHILPHOS Fertilizer Plant in Leyte Industrial Development Estate in Isabel, Leyte.

The samples collected in the two sampling locations, including those collected in Sual coal-fired power plant last year, were processed at the PNRI laboratory and analyzed for radium-226, thorium-232,

potassium-40 and cesium-137 using High Purity Germanium detector. Preliminary results of the analyses indicate the following:

- the activity concentrations of radium-226 in samples collected in Sual and Pagbilao power plants are comparable with activity concentrations of top soil in the country,
- the radium-226 activity concentrations in PHILPHOS are ten times higher than the top soil activity concentration, and
- the activity concentrations of thorium-232 and potassium-40 in samples are within normal levels.

MANAGEMENT OF CTBTO MONITORING STATIONS IN THE PHILIPPINES

RN52 Radionuclide Monitoring Station

The daily operation and maintenance of the RN52 radionuclide monitoring station of the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO) in Tanay, Rizal is continuously being performed by the PNRI.

Monthly reports were submitted regularly to CTBTO International Monitoring System headquarters in Vienna as specified in the Contract for Post-Certification Activities for the CTBTO RN52 Radionuclide Station. Spectral data, meteorological data and all other information gathered at the RN52 station were sent directly to Vienna through a VSAT antenna. Problem reports as well as configuration change notifications and other reports were also sent to CTBTO as they occur.

The meteorological requirements at the station conformed to the technical specifications of the International Monitoring System. As requested by the CTBTO IMS headquarters, air filter samples



Ambient gamma radiation measurement at the PHILPHOS compound at Isabel, Leyte



CTBTO RN52 station in Tanay, Rizal



PNRI air monitoring station at Ateneo De Manila University

were sent to radionuclide laboratories in England, Argentina and Japan for further analysis.

National Data Center

Radionuclide activity concentrations in air particulates measured from the air filters at the RN52 radionuclide monitoring station was obtained from the International Data Center in Vienna, Austria through the National Data Center based in PNRI.

Information on the air filter samples from RN52 station (Philippines) indicated a measurement categorization of level I (typical background radioactivity) and level 2 (anomalous background radioactivity). This means that only natural radioactivity was detected from the air filters at RN52 station. Beryllium-7 and lead-210 were consistently detected and measured. No anthropogenic radionuclides under categories level 3 (typical anthropogenic radioactivity), level 4 (anomalous anthropogenic radioactivity) and level 5 (multiple anthropogenic radioactivity) were detected.

Radioactivity Monitoring of the North Korea Underground Nuclear Test

On 25 May 2009, the Democratic People's Republic of Korea (North Korea) announced that it had conducted an underground nuclear test. Following this announcement, data generated from the radionuclide monitoring station (RN52 Station) in Tanay, Rizal were followed up through the National Data Center (NDCI37) based in PNRI. The reviewed radionuclide reports released by the International Data Center were noted for three weeks.

The results of measurements in RN52 were comparable to the measurements recorded two weeks before the underground nuclear test. Ambient gamma radiation monitoring in the PNRI compound and in selected areas in Metro Manila were conducted immediately following the announced North Korea nuclear test. The portable gamma meter SAM-935 (isotope identifier) was used. Results of gamma dose rate measurements obtained ranged from 84 to 106 nSv/h. This result is comparable to the normal background radiation rate recorded in Metro Manila and is within the country-wide gamma dose rate ranging from 21 to 124 nSv/h.

MONITORING OF PARTICULATE MATTER TO IDENTIFY MAJOR SOURCES OF AIR POLLUTION

PNRI continues to apply nuclear-related analytical techniques for identification and apportionment of air pollution sources. It maintains air sampling sites in Ateneo de Manila University (ADMU), in Valenzuela and in POVEDA. The ADMU sampling site is being maintained in collaboration with the Australian Nuclear Science and Technology Organization.

PM10 mean levels for both POVEDA and Valenzuela sampling sites for the first half of this year have remained below the PNAAQ long-term guideline value of 60µg/m³ while PM2.5 mean levels continue to exceed the US Environmental Protection Agency long-term guideline value of 15µg/m³.

The air pollution data generated by PNRI formed a part of the Philippine Air Quality Status Report prepared by the Environmental

Management Bureau (EMB). The PNRI has been successful in the promotion of its research work on source identification and source apportionment with the EMB so that a collaborative work on "Monitoring on PM2.5 and PM10-2.5 leading to Identification of Sources and Estimation of their Contribution" funded by the EMB has been entered into by PNRI.

APPLICATION OF NUCLEAR TECHNIQUES IN HARMFUL ALGAL BLOOM STUDIES

Radiolabelled Conotoxin for the Monitoring of Harmful Algal Blooms (HAB) in Aquaculture Areas

To assist in the effective management of harmful algal blooms, PNRI is extending the applications of receptor binding assay (RBA) as an alternative monitoring tool for paralytic shellfish poisoning toxins that will complement the standard mouse assay in an accurate, sensitive, rapid and cost-effective manner.

The specific objectives of this study include the production of an active radioiodinated derivative/s of the GIIIA peptide analog. This radioligand is a good substitute for the currently used tritiated saxitoxin because of its stability. Furthermore, radioiodination of peptides with iodine-125 will produce ligands with high specific activity that can be detected by portable gamma detectors, thus permitting in situ monitoring without using liquid scintillant that requires special handling for disposal and expensive bulky counters otherwise required in tritium-based RBA.

Preliminary steps in the preparation of the iodine-labeled GIIIA analog were carried out by cleaving/

deprotection of crude peptides from the resin. These will be analyzed by High Performance Liquid Chromatography and compared with old batches of peptides to check the integrity of the samples against long term storage in freezers and exposure to moisture. The characterization of the cleaved/deprotected peptides will be done prior to the iodination reaction.

Historical Sedimentation Rate and Radiometric Fingerprinting of Suspended-Sediment in Selected HAB Areas

This project is aimed to assess/measure suspended sediment-associated nutrients (selected diagnostic properties of suspended sediments); to infer possible sources of sediments/nutrients using radiometric and chemical physical techniques; and to provide a historical perspective of nutrients and other contaminants in marine sediments in selected areas affected with harmful algal blooms (HAB) using isotopic and nuclear techniques.

A protocol has been established for suspended sediment sampling using a time-integrated sediment sampler and based on actual field testing of sediment samplers on identified study areas in Sorsogon - a HAB-affected area. These samplers are now deployed in identified areas in Sorsogon and successfully collected suspended sediment samples. A soil sampling strategy has been established for source material sample (as possible source of suspended sediments) collection. A total of 92 material source soil sampling stations



A study area on harmful algal bloom research project

have been identified. Preliminary atomic absorption spectrometry results (six elements, 17 samples) generally indicate enhanced level of the elements in suspended sediments than in soil. Sediment core sampling sites have been identified in Sorsogon Bay for lead-210 and cesium-137 measurements. Initial result from lead-210 profile of one coastal core suggests a sedimentation rate of about one cm/yr.

ISOTOPE TECHNIQUES APPLICATION IN WATER RESOURCES MANAGEMENT AND PROTECTION

Verifying recharge process in groundwater systems

Isotope techniques coupled with chemical analysis are used by PNRI in verifying groundwater recharge processes and assessing freshwater quality in an area. The results will assist in formulating policies for the management and protection of groundwater resource in the area. In 2009, investigations were conducted in the municipalities of Balagtas, Baliwag, Bustos, Calumpit, Obando, Plaridel and San Miguel in Bulacan. The vulnerability of the groundwater to contamination/salinization was assessed from the composition of major ions and tritium concentration in the groundwater and surface water.

Most of the groundwater in the areas studied are influenced by saltwater. The salinity of groundwater can be delineated as • due to connate water characterized by high salinity and low tritium; and • due to irrigation waters characterized by high salinity and moderate tritium.

Tritium as tracer of contamination from municipal solid waste disposal leachate

Leachate from landfills has distinct geochemistry from that of freshwater sources: distinctly high concentrations of sodium, chloride, potassium, and calcium, elevated tritium activities and highly enriched in the heavy isotopes of hydrogen and oxygen. These signatures facilitated the tracing of leachate contamination from a landfill facility in Metro Manila. Leachate signatures were traced along the river affected by the landfill. Strong correlation among the concentrations of major ions and tritium in the leachate - affected waters points to the landfill as the source of contamination.

Results of the investigation have shown that the aquifers are not adequately protected against contamination by pollutants from the surface. Infiltration seems to be rapid, taking place throughout the aquifer's outcrop, favored by the presence of fractures in the basaltic rock. Leachate migration has reached the groundwater in the low lying municipality about five km from the landfill. Although it appears to be sporadic, occurring during continuous rainfall that enables the landfill to load the underlying aquifer, and easily flushed out of the system, the re-occurrence of such remains to be a threat to the groundwater that is a main source of the water requirement of the population in the area. This should provide impetus for regulatory agencies to evaluate further the impact of long term operation of the facility.

INDUSTRY

GAMMA RADIATION FOR THE STERILIZATION OF AMERICAN FOUL BROOD-INFECTED MATERIALS

PNRI microbiological research studies have shown that gamma radiation can effectively sterilize beekeeping materials such as hives and frames infected with American Foul Brood (AFB).

AFB is an infectious disease of honey bee, *Apis mellifera*, that poses a threat to the beekeeping industry in the country. The use of gamma radiation at a minimum dose of 15 kGy was proven to be effective for the sterilization of AFB-infected materials. The PNRI recommends this dose for routine disinfection/sterilization of new and used apicultural equipment. Data from this study can be used to prevent and control the spread of AFB in various apiary sites in the Philippines.

Siting Study and Nuclear Fuel Cycle

The verification geochemical survey for radioactive gray nodular monazite and allanite including gold was undertaken from 17 to 28 of February 2009 in Caramay-Magara, Roxas, Palawan to study the extent of their mineralization. The presence of thorium and uranium makes monazite and allanite slightly radioactive.

Characterization of Natural Radioelement Signatures of Porphyry Copper-Gold Deposits in the Philippines

A radiometric-based exploration model over existing/known, but preferably undisturbed gold-rich porphyry copper deposits that can be used for mineral prospecting in other regions of the Philippines

is being validated with known porphyry copper-gold deposits in the Philippines. The data obtained from gammametric survey of Kingking porphyry copper-gold deposit located in Lumanggang-Bacada Area, Pantukan, Compostela Valley, Mindanao Island was compiled and analyzed. This survey area was chosen inasmuch as the covering landscape at the Tiogdan and Casagumayan areas within the Kingking deposit have been highly disturbed due to intense gold panning in these localities.

This study validated the results of the previous study conducted at the San Antonio porphyry copper deposits in Marinduque Island. The combination of potassium and potassium/thorium highs are the radiometric-based indicators in the exploration of porphyry copper+gold deposition. Potassium enrichment in combination with patterns showing potassium/thorium highs, plus total gamma radioactivity and scintillometer reading highs not only provide significant guidance to exploration but make their gamma ray spectrometric detection valuable in the exploration for porphyry copper+gold deposits.

The product of this investigation showed that the gamma ray spectrometric survey technique can be a useful tool in the search for porphyry copper+gold deposits in the country.

ENERGY

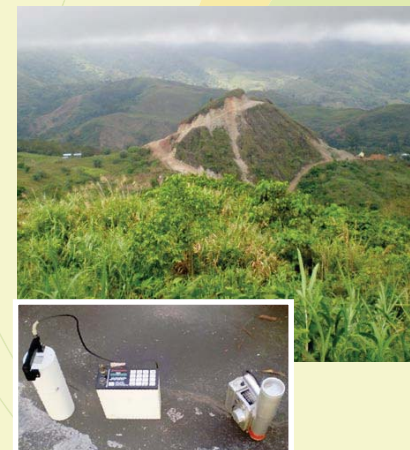
NUCLEAR POWER PROGRAM

Legislative and regulatory framework

In line with the government's efforts to consider nuclear power as a possible energy option, the PNRI as the nuclear regulatory body, has



Electrolytic enrichment of tritium in water samples prior to liquid scintillation counting



Copper-gold porphyry deposit at Dinkidi area in Nueva Viscaya. (Inset) The gamma-ray spectrometer



Placing of biological indicators in model beehives



DOST Balk Scientist Dr. Carlito R. Alea (in front of microphone) in discussion with (from left to right) Congressman Mark Coluango, PNRI Director Dr. Alumnanda M. Dela Rosa and DOST Asst. Secretary Ma. Lourdes Orjola and PNRI regulatory and technical staff.

undertaken the following activities to strengthen the national legislative and regulatory framework essential for the nuclear power program:

- review of PNRI's nuclear-power related regulations on reactor site criteria, licensing of atomic energy facilities, licensees for atomic energy facility operators, standards for protection against radiation, and ● technical assistance to the Committees of the House of Representatives on Science and Technology and Reorganization in the proposed bill entitled "Comprehensive Nuclear and Radiation Safety Regulation Act of 2009". PNRI solicited the expert assistance of Dr. Carlito R. Alea, a DOST Balk Scientist awardee in the review of the regulations and the proposed bill.

Human Resources Development

PNRI developed three modules of nuclear power training courses for technical personnel and managers from National Power Corporation (NPC), Department of Energy (DOE) and PNRI. In 2009, five separate sessions were held on Module 1: "Introduction to Nuclear Power" and two sessions on Module 2: "Introduction of Nuclear Engineering" with a total of 211 participants. The PNRI also coordinated with the University of the Philippines College of Engineering for a possible inclusion of nuclear engineering subjects in its academic curriculum.

The Philippines, through the PNRI, availed of the training courses and technical meetings on nuclear

power organized by the IAEA.

The PNRI actively participated in the various programs of the Inter-agency Core Group on Nuclear Energy. The PNRI officials and selected personnel either served as lecturer or attendees in the Workshop of the Core Group held on September 2-4, 2009 in Bagac, Bataan. The workshop identified the 19 infrastructure issues, concerns, current situation, gaps and action plans of each sub-committee.

Public Information and Consultation

As member of the Public Information and Consultation Group, the PNRI organized an Orientation Seminar on Nuclear Power for its members. The seminar was aimed to equip the members of the Public Information and Consultation Group with the basic concepts of nuclear energy. The Institute also organized a Public Information Seminar on Nuclear Energy on December 9, 2009 where around 100 participants from the academe, media, government and non-government organizations including the members of the Public Information and Consultation Group attended. Speakers of the Seminar were nuclear power communication experts from the member-states of the Forum for Nuclear Cooperation in Asia.

A Public Perception Survey on Nuclear Energy for Power Generation as a Long-Term Option in the Philippines is also being developed by the Public Information and Consultation Group. The survey will be conducted nationwide in 2010. Results of the survey will be used in the development of a communication plan for nuclear power.

Provision of Quality S & T Services

A number of clients from industrial, medical, business, academic, research and government institutions have benefited from the numerous applications of nuclear science and technology through the various services of the PNRI.

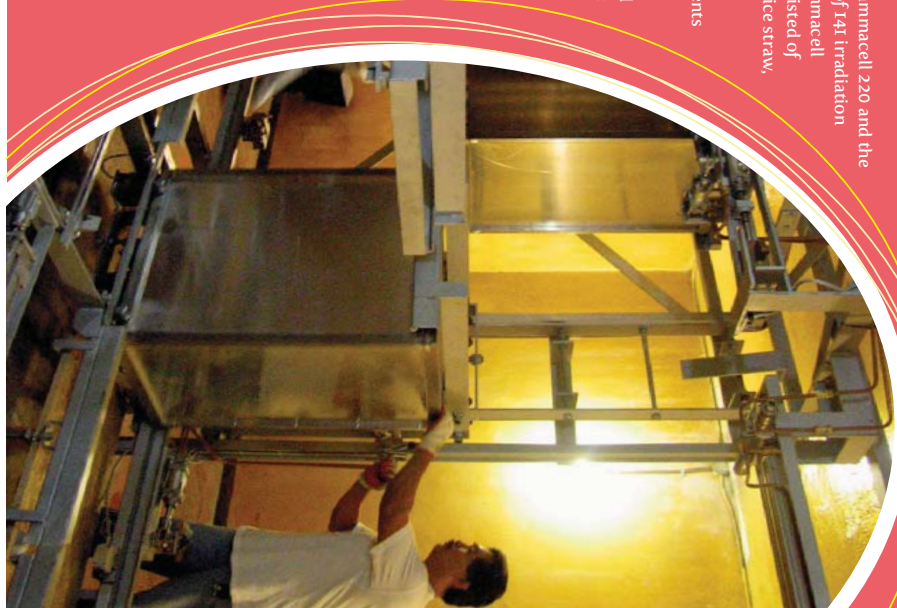
NUCLEAR AND ALLIED SERVICES

GAMMA IRRADIATION SERVICES

PNRI offers gamma irradiation services using the Gammacell 220 and the Multipurpose Irradiation Facility. This year, a total of 141 irradiation services for 30 clients were rendered using the Gammacell 220. Samples irradiated for research purposes consisted of ornamental plants, assorted seeds, tissue cultures, rice straw, mungbean, abaca shoots, mice and fruit fly pupae.

On the other hand, a total of 303 services for 43 clients were extended using the upgraded Multipurpose Irradiation Facility (MIF). Products irradiated for industry for sterilization and reduction of microbial load were: ● spices and herbal products ● cosmetic accessories (e.g. brushes and applicators); ● orthopedic implants; ● frozen bone grafts; ● pre-wetted wipers; ● plastic bag; and, ● hydrogel. The samples irradiated for research purposes consisted of fresh mangoes and mangoes infested with pulp weevil.

This year, the volume of products that can be irradiated at the MIF was further increased with the arrival in March 2009 of the additional 150 kilo curie (KCi) of cobalt-60 source from MDS Nordion of Canada. The upgrading of MIF was cost shared by the Philippines (through the DOST) and the Bureau of Plant Industry/United States-Department of Agriculture Project entitled "Increasing the Export Competitiveness of the Philippine Fresh Super Mangoes" and the IAEA (through the Technical Cooperation Project on Upgrading of the Irradiation Facility).



RADIATION PROTECTION SERVICES

To ensure that workers occupationally exposed to radiation do not receive undue exposure, the Institute, through the Radiation Protection Services (RPS), provided the following services to authorized users of ionizing radiation and radioactive materials in medical, industrial, commercial and research institutions.

Personnel Monitoring

Through the film badge and thermoluminescent dosimetry service, the RPS monitored and assessed the external exposure of 5,214 workers from 1,647 institutions who were occupationally exposed to radiation.

Secondary Standards Dosimetry Laboratory (SSDL) Calibration

This service involves the calibration and standardization of radiation measurements to ensure the compliance of radiation protection and dosimetry practices of radiation facilities with international measurement standards. The SSDL services provided for this year were the following: • calibration of 814 radiation monitoring instruments and dosimeters such as contamination meter, pendosimeter, and survey meter; • output calibration of 14 brachytherapy activity meters; and • radiation monitoring and hazards evaluation of radiation facilities.

Radiation Control and Hazards Evaluation

The RPS continued to provide these services to authorized facilities to ensure that their equipment and devices as well as their working practices are in accordance with

institutional radiation safety standards.

The radiation control services provided were: • leak testing of 165 sealed sources from Metro Manila and the provinces; • rental of 127 units of survey meters; and • counting and analysis of swipe samples from 430 radiation devices.

Radioactive Waste Management

To ensure proper and safe management of spent or unused radioactive sources, the Institute continued to maintain and operate the National Radioactive Waste Management Facility at the PNRI compound. This year, RPS collected and managed 104 disused radiation sources; and 91 liters of radioactive wastes and 0.10 cu.m. of solid wastes generated by licensed users of radioactive materials.

NUCLEAR-BASED ANALYTICAL SERVICES

Nuclear and related techniques were used by PNRI's Analytical Measurements Research Group (AMRG) to provide analytical services to 118 clients. A total of 360 samples were analyzed for this year.

The analyses consisted of the following: • determination of radioactivity in 222 samples of food products and water (through gammametric or alpha-beta analysis); • detection of acetic acid adulteration in five samples of vinegar by carbon-14 assay; • elemental analysis of 13 samples by x-ray fluorescence (XRF); and • contract service for determination of gross alpha, beta and radon in 120 water samples.

In July 28, 2009, the AMRG Laboratory was awarded with ISO 17025:2005 accreditation

(LA-2009-I45A) by the Philippine Accreditation Office during ceremonies held at the PNRI. This achievement was made possible with assistance from the DOST GIA Project, "Establishment, Implementation and Maintenance of Management Systems in all DOST RDIs and ROs". The scopes covered by the accreditation are: "Gammametric Analysis of Food and Related Items" and "Gross Alpha Beta Analysis of Water".

CYTOGENETIC ANALYSIS

The Cytogenetic Group extended the following services: • determination, through blood sample analysis, of the radiation exposure of two workers who work in a radiation facility abroad; and • determination/confirmation of the presence or absence of genetic disorder (Down Syndrome) in newborn babies. These clients were referred to PNRI by doctors and medical practitioners.

COMPUTER SERVICES

The Computer Services Group continued to expand and maintain the local area network (LAN) and Internet infrastructure of the PNRI, Internet/Intranet applications and services such as the website (<http://www.pnri.dost.gov.ph>), email, Domain Name Server, and others. In support to the Institute's knowledge management initiatives, the Group continued to pursue the development of the PNRI Web Center for Nuclear Knowledge Resources for nuclear knowledge preservation which will provide easy access to nuclear knowledge resources. Preservation, through digitization of documents from the regulatory and pre-operational activities of the Bataan Nuclear Power Plant, was initiated.

In support of the Institute's regulatory function, the Group developed an action plan for the Regulatory Authority Information System (RAIS); the software was provided by the IAEA for free use of its Member States. The action plan will be implemented in 2010.

The Group also served as the focal point of contact of the Institute, providing expertise and/or coordination in its participation in external information and communication technology (ICT)-related activities, such as:

- preventive maintenance of the ICT component of the Radiation Portal Monitoring system at South Harbor and Manila International Container Terminal in Port Area, Manila;
- Philippine government's National Single Window (electronic trade system for importers and traders);
- preventive/corrective maintenance of the ICT component of the CTBTO's Radionuclide Monitoring Station in Tanay, Rizal; and
- CTBTO National Data Center at PNRI.

ENGINEERING SERVICES

In support of the research, regulatory and service activities of the Institute, the following jobs were completed: • repair of electro-mechanical devices and radiation/nuclear instruments/equipment for PNRI and non-PNRI clients; and • fabrication of equipment and devices.

In addition to the fabrication, repair and maintenance activities, the Group conducted preventive maintenance of the North and South harbor radiation portal monitors for the Megaports Initiative project. The Group also provided support in the decommissioning of the cobalt-60 source head at Davao Doctors Oncology Hospital.



Removal of radiation source disposed from a nuclear density gauge from a cigarette factory



The Analytical Measurements Research Group was awarded with ISO- 17025:2005 Accreditation (LA-2009-145A) by the Philippine Accreditation Office during ceremonies held at the PNRI.



Repair of a radiation detection instrument



Preventive maintenance of the ICT component of the radiation portal monitoring system



Codes of PNRI Regulations

NUCLEAR REGULATORY SERVICES

The PNRI provides these services to ensure that the use of radioactive materials for peaceful applications is carried out safely.

STANDARDS DEVELOPMENT

The PNRI continued to develop regulations, standards, guides and bulletins to further enhance its nuclear regulatory functions and to highlight the safety and security requirements in the use of nuclear materials. This year, the PNRI through the Standards Development Section (SDS), developed and facilitated the publication of three Codes of PNRI Regulations (CPR) and two Administrative Orders (AO) in the Official Gazette.

Three other CPRs have been drafted and currently undergoing review. The three CPRs for publication are as follows: • CPR Part 14, "Licenses for Medical Use of Sealed Radioactive Sources in Brachytherapy" • CPR Part II, "Licenses for Industrial Radiography and Radiation Safety Requirements for Radiographic Operations" • CPR Part 17, "Licenses for Commercial Sale and Distribution of Radioactive Materials and Its Associated Devices"

The other CPRs for review are: • CPR Part 5, "Reactor Site Criteria" • CPR Part 7, "Licensing of Atomic Energy Facilities" • CPR Part 9, "Physical Protection of Nuclear Power Plants and Materials"

The two AOs published in the Official Gazette were: • AO No. 1, Series of 2009, "Guidance Levels for Representative Radionuclides in Foods Following Accidental Nuclear Contamination" and • AO No 2, Series of 2009, "Authorization for Transfers of Nuclear-Related Dual Use Equipment, Materials, Software and Related Technology.

Regulatory Guides for CPR Part 12 (Teletherapy) and CPR Part 15 (Large Irradiators) were developed and implemented.

PNRI conducted a regulatory conference for CPR Part II with stakeholders operating within and outside Metro Manila. Three focus group discussion meetings were also organized by PNRI with the National Certifying Body (for radiography) and the Philippine Society for Nondestructive Testing.

LICENSING REVIEW AND EVALUATION

The PNRI Licensing Review and Evaluation Section (LRES) evaluated license applications for authorization to use, sell and import radioactive materials. Based on LRE's evaluation and recommendation, PNRI issued a total of 284 licenses (20 new, 228 renewed and 36 amended).

These licenses were issued to the following: • 29 commercial establishments to engage in sale and distribution of radioactive materials; • 86 clinics and hospitals to use radioactive materials in the diagnosis and treatment of diseases; • 128 companies/institutions for industrial purposes such as level gauging and thickness gauging, among others; • 21 companies for industrial radiography; and • 21 institutions for research purposes. Six pre-licensing inspections were conducted to verify compliance with licensing requirements and confirm the commitments of the applicants in the license applications.

The PNRI, through the LRES, issued 471 Certificates of Release to the Bureau of Customs to ensure that shipments of imported radioactive materials are released only to PNRI licensed users and/or suppliers.

INSPECTION AND ENFORCEMENT

The Inspection and Enforcement Section (IES) verified and monitored compliance of licensees to PNRI regulations and specific requirements relative to safety and security of radioactive sources and safety of radiation workers.

This year, IES accomplished the following: • regulatory inspections of 152 radioactive materials and facilities and issuance of corresponding official inspection report to licensees on the results of the inspection; • generation of 68 evaluation reports from the licensee's proposed corrective actions on the items of non-compliance and concern/s found and reported during the inspection, • follow-up inspections of unresolved inspection findings to two licensees to verify corrective actions taken; • regulatory inspection of four PNRI facilities and laboratories in support of the PNRI Internal Regulatory Control Program; • unannounced regulatory inspections and audit of licensed radioactive materials and facilities to verify compliance with PNRI regulations and specific requirements relative to safety and security of radioactive sources; and • enforcement action such as "Notice of Violation, Show cause Order and License Revocation" to seven licensees. • issuance of 3,116 Authority to Transport Certificates to licensees for the transport of radioactive materials to authorized locations in the country and for the shipment of disused sealed sources

back to the original supplier and/or foreign consignees.

NUCLEAR SAFEGUARDS AND SECURITY

The PNRI, as the national competent authority on nuclear matters in the Philippines, continued to fulfill its obligation in connection with the country's agreement with the International Atomic Energy Agency (IAEA) on Non-Proliferation of Nuclear Weapons. As part of this commitment, PNRI hosted the annual visit of IAEA safeguards inspectors who conducted a physical inventory of nuclear fuels and design information verification at the Philippine Research Reactor-I. PNRI submitted three nuclear material accounting reports to the IAEA. Furthermore, the Safeguards Group prepared a letter of acceptance to the IAEA's proposed safeguards inspections for the Philippines.

The PNRI, through the Safeguards Group, also conducted the following: • facilitated an IAEA Integrated Nuclear Security Support Plan (INSSP) Meeting of two IAEA experts with government agencies responsible for the National Nuclear Security Plan in July 2009. The INSSP prepared by the IAEA was accepted by PNRI for implementation; • coordinated with the National Intelligence Coordinating Agency in the briefing of Executive Order "Establishing a National Security Clearance System for Government Personnel with Access to Classified Matters and Other Purposes" in August 2009 and to designated security offices.



Monitoring and verification inspection of moisture density gauge containing Am-241 sealed source during regulatory inspection.

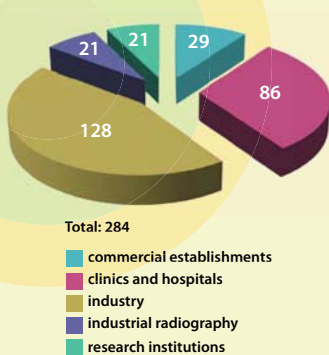


Fuel verification in PRR-1 with IAEA safeguards inspection



Pre-licensing inspection of a brachytherapy facility

Distribution of Licensed Users of Radioactive Materials



MEGAPORTS INITIATIVE PROGRAM

To detect illicit shipments of nuclear and other radioactive materials, the United States and the Philippines signed a Memorandum of Intent in 2005 to install radiation monitoring/detection system at the ports of Manila. This agreement is under the United States Department of Energy-National Nuclear Security Administration.

As part of this initiative, PNRI carried out the following activities for 2009: • continuous operation of the Mirror Central Alarm System (CAS) installed at PNRI to respond to alarms from the ports; • technical assistance to the Bureau of Customs – Central Alarm System and terminal operators during alarms; • coordination of the monthly preventive maintenance of and troubleshooting of the radiation portal monitors and the information technology communication systems at the North and South Harbor; • coordination in the investigation and tertiary inspection of a 20-foot container van containing gas mantles detected for thorium (a naturally occurring radioactive material) at MICT in June 2009; and • coordination of meetings of the US DOE/Megaports Team with port terminal operators during the team's four visits in Manila to discuss Phase II of the project and its implementation.

RADIOLOGICAL IMPACT ASSESSMENT

In support of the internal regulatory control program of PNRI, the Radiological Impact Assessment Section (RIAS) evaluated the safety assessment report on the process and procedures for the transfer and temporary storage of radioactive

materials from the Isotopes Storage Room of the Isotopes Techniques Research Group (ITRG) to the Irradiation Services Laboratory of the PNRI and vice versa. The temporary transfer was in connection with the upgrading of the ITRG building in 2009.

A safety report that discussed assessments on projected doses to the workers and members of the public during normal operation and projected exposure rates during abnormal condition was prepared. This is in support of the decommissioning activity undertaken by a PNRI team on March 18-22, 2009 on the decommissioning of the Disused Teletherapy Machine at the Davao Doctors Oncology Center. The assessment supported the ongoing efforts in the physical protection upgrades of facilities under Category I Sources.

In coordination with Standards Development Section, and in support of the development of PNRI regulations, the RIAS prepared PNRI Administrative Order No. 01, Series of 2009 entitled "Guidance Levels for Representative Radionuclides in Foods Following Accidental Nuclear Contamination". The guidance levels shall be the basis in ensuring that foods moving in international trade following accidental nuclear contamination are safe for human consumption.

RADIOLOGICAL EMERGENCY PLANNING AND PREPAREDNESS

In line with the continuing emergency preparedness program of the PNRI, a meeting among Emergency Exercise Controllers, Evaluators and Facilitators were conducted on 30 April 2009 to review the functions and responsibilities of the personnel involved, including the team procedures, during an emergency exercise. PNRI participated in the

following emergency exercises conducted by the IAEA Incident and Emergency Response Center (IEC): • Exercise Conv-Ex-2b on 26 May 2009, which involved simulating the response to a generic situation report sent by the IEC; • Convex I- a on 16 July 2009, which involved immediate access to the Emergency Notification and Assistance Conventions (ENAC) website; • Exercise Convex-2d on 13 August 2009, which consisted of three messages with two pre-designed emergency scenarios that required assessing existing national capabilities; and • Exercise Convex-2a on 14 October 2009, which included immediate access to ENAC, review of the Convex-2a exercise message and sending the confirmation back to IEC by email or fax as soon as possible.

The PNRI conducted trainings and drills on radiological emergency preparedness and response for participants of the PNRI's nuclear training courses. A total of eight trainings and drills which were participated in by 144 professionals from various disciplines in industry, medicine, and academe were conducted.

To facilitate the implementation of the PNRI Emergency Plan and the RADPLAN, an Emergency Awareness Seminar and General Exercise that focused on Chemical, Biological, Radiological and Nuclear (CBRN) and Explosive Hazards and Emergencies was conducted on 21 May 2009 at the PNRI Auditorium. This was attended by PNRI personnel including members of the janitorial and security agencies on contract with PNRI. A PNRI-ANSTO National Radiological Emergency Response Workshop for PNRI emergency response personnel and first responders of the Hazardous

Materials Team – Bureau of Fire Protection and Philippine National Police was also conducted on 5-8 October 2009.

ESTABLISHMENT OF A NEAR SURFACE RADIOACTIVE WASTE DISPOSAL FACILITY IN THE PHILIPPINES

Under this project, the following activities were undertaken: • development of a concept paper on the preliminary design of the proposed repository for radioactive waste. The concept involves a footprint of about 34 hectares for potential development and foresees a total volume of conditioned waste of 50,000 cubic meters;

• Borehole co-disposal at the proposed site is currently under investigation by PNRI. An initial selection of disused sealed sources, so-called SHARS (Spent High Activity Radioactive Sources), has been proposed by the Nuclear Energy Commission of South Africa. An analysis is made of the performance requirements of the disposal canister in view of the projected radionuclide inventory.

• conduct of an iteration of the conceptual and near field model that includes integration of results with the updated hydrogeological model, and the generic biosphere model, as appropriate. This is in cooperation with an IAEA expert; IAEA expert missions were also undertaken in 2009.

• Dr. Dirk Mallants-assistance on further iteration of safety assessment studies based on developments on site characterization, preliminary data, hydro-geological modelling, and waste inventory. • Dr. Dirk Mallants and Dr. Bernard Nerdael – identification of the location of drill holes in support of the borehole disposal concept and review and verification of site



Mirror Central Alarm System at PNRI



The PNRI Emergency Response Center



A PNRI-ANSTO National Radiology Emergency Workshop at PNRI



Inspection of the status of groundwater observation wells in the vicinity of the footprint



Computer modelling with the IAEA expert

specific data parameters application of field conceptual modelling.

- Dr. Bernard Nerdael – the terms of reference for the planned subcontract for drilling of a 100 meter-deep borehole. The drilling program is expected to provide data and information for the characterization of the subsurface materials at the preferred site in Cagayan province relative to geological, hydrogeological and hydrogeochemical aspects, including its acceptability for borehole disposal of sealed radioactive sources.

GLOBAL THREAT REDUCTION INITIATIVE

The PNRI continued to participate in this program of the United States Department of Energy (US DOE) which aims to address the issue of nuclear security around the world and reduce the threat of nuclear terrorism.

During this period, the US DOE/PNNL experts and the PNRI conducted security assessment of high dose radioactive materials at Baguio General Hospital teletherapy bunker and proposed security enhancements. They also visited the Zamboanga City Medical Center, UP-Philippine General Hospital, Jose Reyes Medical Center, and Rizal Medical Center to check the progress of work and verify the security system being installed at the teletherapy bunker. Installation of security upgrades were also undertaken at the National Kidney and Transplant Institute, Veterans Memorial and Medical Center, and Gamma Knife Center. Physical protection in the following PNRI facilities were also upgraded for international standards on security: Central

Alarm System (CAS), Radioactive Waste Management Facility, Cobalt-60 facility, and the Secondary Standards Dosimetry facility. PNRI also coordinated the decommissioning activity of the teletherapy facility in Davao Doctors Oncology Center in March and prepared the transport security plan of the disused cobalt-60 source from Davao to PNRI.

PNRI also coordinated the following related activities:

- Workshop on Security in the Transport of Radioactive Materials for managers and decision makers at Crowne Plaza Hotel and the Training Course on Security in the Transport of Radioactive Materials at PNRI on 23 – 26 March under the sponsorship of Oak Ridge National Laboratory /US DOE, ANSTO and ARPANSA
- National Assessment on Transport Security of Radioactive Materials conducted by experts from Oak Ridge National Laboratory to discuss possible assistance in the drafting of a transport security regulation for the Philippines
- Training Course on the Applications of Security Plan and Procedures for Security Group A Sources and a Writeshop in September under the Regional Security of Radioactive Sources Project of ANSTO
- Meeting on “Response to Incidents Involving Theft of Radioactive Sources” with the Philippine National Police and US Team.



Decommissioning activity in Davao Doctors Oncology Center teletherapy machine



ARPANSA expert prepares the transport demo for participants of training course on Security in the Transport of Radioactive Materials.

S & T Linking and Networking

PNRI maintained and strengthened its cooperative programs with both local and international organizations to further advance the conduct of nuclear research and development activities in various areas; to enhance the regulatory function of the institute; and to better promote the peaceful applications of nuclear science and technology in the Philippines.

LOCAL

The PNRI continued to avail of the support of the DOST, its mother agency, and other DOST agencies for the implementation of a number of nuclear-related activities. This year, support from the following DOST agencies were obtained:

- Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD)
- Philippine Council for Aquatic and Marine Research and Development (PCAMRD)
- Philippine Council for Industry and Energy Research and Development (PCIERD)
- Philippine Council for Advanced Science and Technology Research and Development (PCASTRD)
- Technology Application and Promotion Institute (TAPI).

OTHER LOCAL PARTNERS:

Other project collaborators include the following:

- Department of Energy
- National Power Corporation
- BIOTECH
- Bureau of Soils & Water Management (BSWM)
- University of the Philippines Marine Science Institute (UP-MSI)
- Bulacan Water District
- University of the Philippines-Los Baños (UPLB)
- Department of Agriculture/Bureau of Plant Industry (BPI)
- Department of Agriculture
- Department of Environment and Natural Resources (DENR- Environmental Management



- Bureau)
- Bacolod City Water District (Baciwa)
- BIOTECOS Co.
- Bulacan Agricultural State College, San Ildefonso, Bulacan
- Coca Cola, Philippines

FOREIGN

The Philippines, through the PNRI, remains a staunch partner of the following foreign organizations/institutions:

- International Atomic Energy Agency (IAEA)
- Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific (RCA)
- Forum for Nuclear Cooperation in Asia (FNCA)
- Japan
- Comprehensive Nuclear Test Ban Treaty Organization (CTBTO), Vienna, Austria
- Australian

- Nuclear Science and Technology Organization (ANSTO)
- United States Department of Energy (US-DOE)
- United States Department of Agriculture (USDA)
- Ministry of Science, Technology, Education, Culture and Sports (MEXT) of Japan
- Nuclear Research Safety Association (NSRA) of Japan

Through these partnerships, PNRI was able to avail of six research contracts, ten technical cooperation projects; the services of 18 foreign experts/mission delegates; and 145 fellowships and travel grants for PNRI staff and non-PNRI personnel (See appendices pp 39-46). As part of these cooperative endeavors, PNRI hosted eight meetings, seminars/workshops and regional training courses (See p. 38).

37th ATOMIC ENERGY WEEK

December 7-11, 2009
Theme: "Nuclear Science and Technology: Responding to Global Challenges"

The PNRI spearheaded the celebration of the 37th Atomic Energy Week (AEW) on December 8 to 11, 2009. Several activities were lined up to highlight the beneficial uses of nuclear science and technology in food and agriculture, health care, industry, energy, and the environment.

THANKSGIVING MASS
Officiated by
Rev. Fr. Jerry Orbos, SVD
Christ the King Seminary



WREATH LAYING
at the monument of Gen. Florencio A. Medina, considered as the Father of Atomic Energy in the Philippines

OPENING CEREMONIES

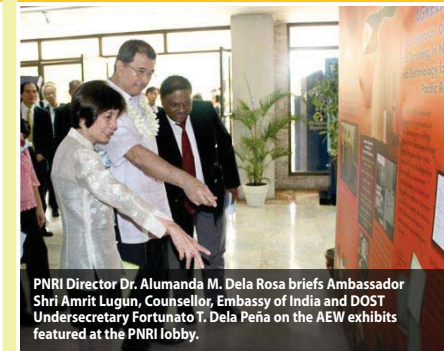


PNRI Director Dr. Aluman da M. Dela Rosa gives a mutant plant as token of appreciation to DOST Undersecretary Fortunato T. Dela Peña who represented DOST Secretary Estrella F. Alabastro in delivering the inspirational message. Also in photo is Dr. Graceta DL Cuevas, AEW Executive Committee Chairperson.



The JMEG Chorale of the University of the Philippines renders a special number.

OPENING OF EXHIBITS



PNRI Director Dr. Aluman da M. Dela Rosa briefs Ambassador Shri Amrit Lugun, Counsellor, Embassy of India and DOST Undersecretary Fortunato T. Dela Peña on the AEW exhibits featured at the PNRI lobby.

OPEN HOUSE



Students, teachers and other visitors viewed the exhibits, availed themselves of the guided tours and film showing and participated in the exhibit quiz.

TECHNICAL SESSIONS



The topics for the Technical Sessions were the following: December 8 - Nuclear Power option for Energy Security; December 9 - Public Information Seminar on Nuclear Energy; December 10 - Nuclear S & T for Health Care and



the Environment. Among the presenters were (from left to right) December 8: Dr. Vangeline K. Parami, Head, Licensing Review and Evaluation Section, PNRI; December 10: Dr. Suelo Machi, FNCA Coordinator, Japan; and December 10: Dr. Cesar Saloma, Dean, College of Science, UP Diliman.



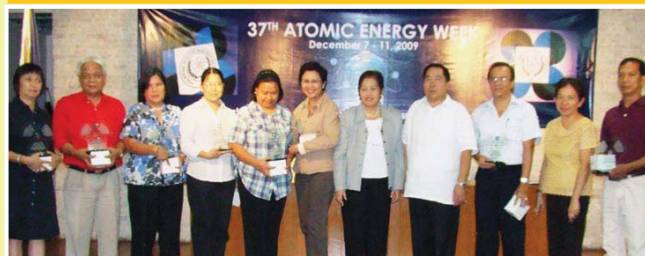
Counsellor Shri Amrit Lugun of Indian Embassy (2nd from right) and participants of the Forum for Nuclear Cooperation in Asia Public Information Project Leaders Meeting pose with PNRI officials Dr. Aluman da M. Dela Rosa (3rd from right) and Dr. Corazon C. Bernido (extreme right), Director and Deputy Director, respectively.

NUCLEAR SCIENCE QUIZ



Alvin S. Uy Lim and Angelo Miguel P. Lorenzo (2nd and 3rd from right) of Quezon City Science High School were the First Prize Winners from among 54 contestants from 27 public and private high schools in Metro Manila. Their adviser/coach was Ian Mark F. Alilas (3rd from left).

CLOSING CEREMONIES



Eight of the thirteen PNRI 30-year service awardees with Dr. Graceta DL Cuevas, AEW Executive Committee Chairperson (2nd from right), Deputy Director Dr. Corazon C. Bernido (5th from right) and Rufino G. Co, Executive Assistant to Quezon City Vice Mayor Herbert Bautista.



Quezon City Vice Mayor Herbert Bautista, who was the guest speaker, was represented by Rufino G. Co, Executive Assistant to the Vice Mayor.

A NIGHT AT PNRI

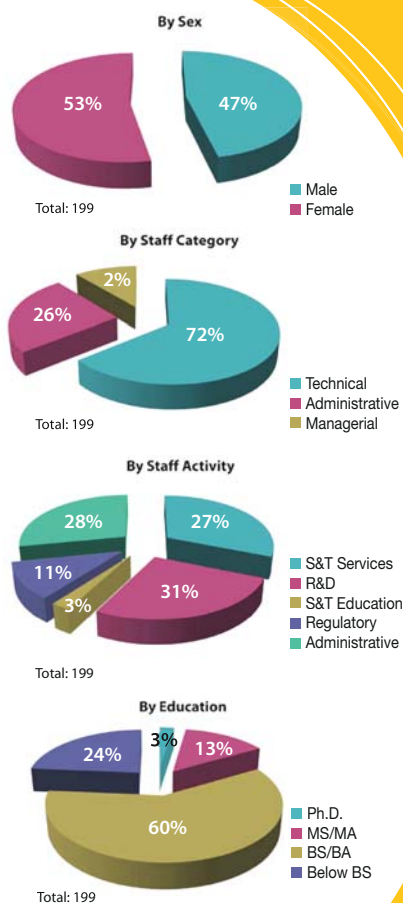


30-YEAR SERVICE AWARDEES

Renato T. Bañaga	Luvimina G. Lanuza	Sotero S. Resilva
Adelina DM. Bulos	Quirino M. Mendoza	Demetrio S. Salom
Rosita R. Daroy	Vangeline K. Parami	Remigio M. Sarmiento
Roberto N. Fontanilla	Susan S. Pascual	Ana Maria S. Veluz
Noel B. Gerilla		

Human Resource Development

The PNRI has always emphasized the need for the development of human resources in the field of nuclear science and technology as a major component for the implementation of the Institute's mandate to develop and regulate the safe and peaceful uses of nuclear science and technology in the Philippines.



PROFILE OF R&D PERSONNEL BY POSITION		
CATEGORY	NUMBERS	%DISTRIBUTION
Total Number of R&D Personnel	62	
By Position		
Scientists and Engineers	45	73%
Technicians	7	11%
Auxiliary Personnel	10	16%

PROFILE OF SCIENTISTS AND ENGINEERS		
CATEGORY	NUMBER	%DISTRIBUTION
Total Number of Scientists and Engineers	45	%
By Sex		
Male	15	33%
Female	30	67%
By Age Group		
20 years old and below	-	0%
21-30	5	11%
31-40	7	15%
41-50	9	20%
51-60	17	38%
61 years old and above	7	16%
By Educational Attainment		
With PhD	1	2%
MS/MA	18	40%
Post BS/BA	-	0%
BS/BA	25	56%
Post High School	1	2%
High School and below Work	-	0%
By Field of Research		
Natural Sciences	32	71%
Engineering and Technology	2	4%
Agricultural Sciences	10	22%
Medical Sciences	1	2%
Social Sciences	-	0%
Humanities	-	0%

Human Resource Development

LOCAL

- PNRI, through its Nuclear Training Center, conducted 40 nuclear training courses participated in by 869 professionals from government and private agencies. See page 34.
- PNRI accepted 64 students for on-the-job training and nine students for thesis advisorship. See page 35.
- PNRI provided its employees the opportunity to participate in 47 locally-sponsored or conducted training/seminar/workshop in various fields. See pages 46-48.

- PNRI provided support to its personnel availing of scholarship programs (3 PhDs and 2 MS degrees); and those pursuing graduate studies on their own (3 PhDs and 2 MS degrees). See page 48.

FOREIGN:

- This year, through its linkage with institutions and agencies, PNRI was able to avail of 143 training/fellowship grants for PNRI staff and non-PNRI personnel. See page 35-46.

PNRI RECOGNITION AWARDS

PNRI gave recognition awards to the following during the closing ceremonies of the 37th Atomic Energy Week Celebration on December 11:

SECTION HEAD OF THE YEAR AWARD and DIRECTOR'S CHOICE AWARD

MS. ELVIRA Z. SOMBRITO
Head, Chemistry Research Section
Atomic Research Division (ARD)



JUNIOR EXECUTIVE AWARD: SCIENCE ADVOCATE (TECHNICAL)

MS. PRECIOSA CORAZON B. PABROA
Science Research Specialist II
Analytical Measurements Research
Atomic Research Division

JUNIOR EXECUTIVE AWARD ADMINISTRATIVE SERVICE ADVOCATE (NON-TECHNICAL)

MR. LINO REJAS
Engineer II
General Services Unit, FAD



AT-YOUR-SERVICE AWARD

MS. LAURA LEYVA
Administrative Assistant II
Property and Procurement Unit
Finance and Administrative Division



SPORTS RECOGNITION AWARD was given to the **PNRI TABLE TENNIS TEAM** (represented by Marcelo Bautista, extreme left, and Dante Bajet, 2nd from right) for winning the championship in the Table Tennis Competition during the DOST Sports Fest. Also in photo are PNRI Deputy Director Dr. Corazon C. Bernido, Rufino G. Co, Executive Assistant to Quezon City of Vice Mayor Herbert Bautista and Dr. Graceta DL Cuevas, Finance and Administrative Division Chief.



IS AWARD was given to **INSPECTION AND ENFORCEMENT SECTION** (represented by Edgar Racho and Teresita De Jesus, 2nd and 3rd from left, respectively)

RECOGNITION AWARDS TO PNRI

CERTIFICATE OF RECOGNITION TO THE PHILIPPINE NUCLEAR RESEARCH INSTITUTE OF THE DEPARTMENT OF SCIENCE AND TECHNOLOGY (DOST-PNRI)

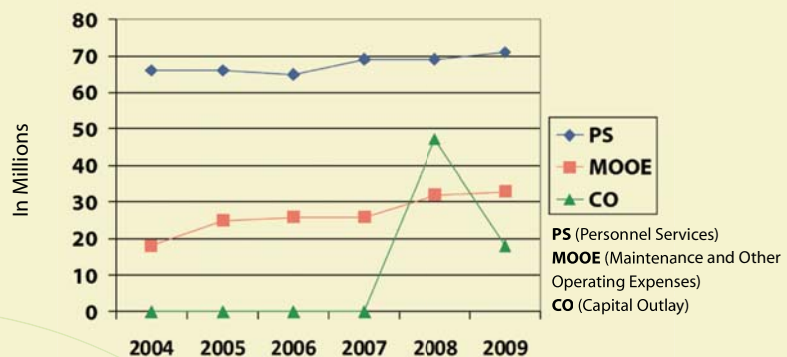
- From the Office of the President of the Philippines Anti-Graft Commission (PAGC) for ranking (8th) among 177 agencies in terms of compliance to the requirements of the Integrity Development Action Plan (IDAP) for the year-end 2009.

CERTIFICATE OF RECOGNITION TO THE BIOMEDICAL RESEARCH LABORATORY OF PNRI

- From the University of the Philippines Los Baños Bee Program for fostering research collaboration on the control of bee diseases and for efforts in harnessing the pharmaceutical potential of honey and other bee products.

Financial Resources

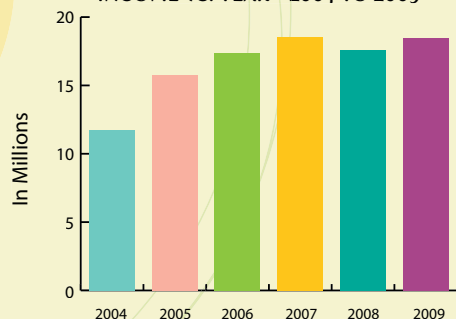
TREND OF PNRI BUDGET • 2004-2009



ADDITIONAL RESOURCES GENERATED FROM EXTERNAL SOURCES	
GRANT	AMOUNT
LOCAL	Php 46,927,898.17
FOREIGN	
Cooperation Agreements	7,682,139.09
IAEA Technical Cooperation Projects	40,518,269.40
IAEA Research Contracts	2,288,600.00
Subtotal (Foreign): Php 50,489,008.49	
Grand Total: Php 97,416,906.49	

See Appendices, Table 14 on page 49 for list of grants.

INCOME VS. YEAR • 2004 TO 2009



INCOME FROM PNRI SERVICES * 2009

A. NUCLEAR AND ALLIED SERVICES	
Name of Service	Income Generated (in Pesos)
IRRADIATION SERVICES	
• Use of Multipurpose Gamma Irradiation Facility and Gammacell 220)	2,922,206.00
• Sale of radioactive sign stickers, use of dose calibrator diagnostic instruments)	8,940.00
RADIATION PROTECTION SERVICES	
• Personnel Monitoring	9,500,181.06
- Film badge service	
- Thermoluminescent dosimetry	
• Calibration of Radiation Detection Instruments	986,760.00
- Survey meter	
- Pen dosimeter	
- Contamination meter	
- Dose calibrator	
- Teletherapy output calibration	
• Radiation Control Services	298,260.00
- Leak testing of sealed sources	
- Radiological support for non-PNRI clients, radiation and hazard evaluation	
• Radioactive Waste Management	183,950.00
- Solid waste	
- Liquid waste	
- Spent sealed sources	
- Teletherapy sources	
• Special Services	795,760.00
- Rental of survey meter/moisture density gauge	
- Swipe sample counting	
ENGINEERING SERVICES	
• Repair of nuclear instruments	14,450.00
• Assembly of survey meter	
ANALYTICAL SERVICES	
• Analytical Measurements Research Unit	821,036.00
- Gross alpha-beta analysis of water samples	
- Gammametric analysis	
- Elemental analysis by X-ray Fluorescence Spectrometer (XRF)	
- Vinegar adulteration	
- Other services such as sediment dating, use of the liquid scintillation counter (LSC)	
• Applied Physics Research Unit	14,420.00
- Structural analysis using X-ray diffraction (XRD) spectrometer	
CYTOGENETIC SERVICE/MICROSCOPY SERVICES	
	56,500.00
MICROBIOLOGICAL TEST	
• Bioburden analysis	124,044.00
• Sterility test and aerobic plate, mold and yeast count	
SUB TOTAL: Php 15,726,507.06	
B. NUCLEAR REGULATORY SERVICES	
LICENSING REVIEW AND EVALUATION	
• Licensing Fees	922,715.00
• Certificate of Transport Fee	963,485.00
• Certification of Release (shipments of radioactive material)	148,100.00
INSPECTION AND ENFORCEMENT	
• Inspection fee	558,510.00
• Surcharge Fines/Penalties for Permits/Licenses	435,390.00
STANDARDS DEVELOPMENT	
- Sale of CPR (Code of PNRI Regulations) compilation for specific parts and Infopacs (Information Packages)	1,300.00
SUB TOTAL: Php 2,639,500.00	
GRAND TOTAL: Php 18,366,007.06	

Appendices

TABLE 1. TECHNICAL TRAINING COURSES CONDUCTED IN 2009

TITLE OF TRAINING	TRAINING VENUE/ LOCATION	NO. OF PARTICIPANTS	INCLUSIVE DATES CONDUCTED	FUNDING SCHEME
RADIOISOTOPE TECHNIQUES				
Radioisotope Techniques Training Course (Medical) – 92nd session	PNRI, Diliman, Quezon City	35	July 6 – 31	Individual fee-paying
Radioisotope Techniques Training Course (Medical) – 93rd session	PNRI	14	September 8 – October 2	Individual fee-paying
NUCLEAR SCIENCE AND TECHNOLOGY				
Seminar in Nuclear Science for High School Science Teachers – 33rd session	PNRI	13	April 20 – May 22	PNRI-sponsored
Nuclear Technology for University/College Faculty – 42nd session	PNRI	4	April 20 – May 22	PNRI-sponsored
RADIATION SAFETY				
Safety in the Use of Nuclear Equipment and Devices Training Course – 28th session	Daewoo E & C Co. Ltd, Alcala, Pangasinan	10	January 6 – 10	Company-sponsored
Safety in the Use of Nuclear Equipment and Devices Training Course – 29th session	PNRI	12	February 16 – 20	Individual fee-paying
Safety in the Use of Nuclear Equipment and Devices Training Course – 30th session	Team Energy Corp., Pagbilao, Quezon	10	March 2 – 6	Company-sponsored
Safety in the Use of Nuclear Equipment and Devices Training Course – 31st session	Team Sual Corp., Sual, Pangasinan	10	May 25 – 29	Company-sponsored
Safety in the Use of Nuclear Equipment and Devices Training Course – 32nd session	PNRI	20	June 1 – 5	Individual fee-paying
Radiation Safety Course for Medical and Radiopharmaceutical Facilities	PNRI	12	June 19 – August 28 (Fridays only)	Individual fee-paying
Safety in the Use of Nuclear Equipment and Devices Training Course – 33rd session	Coral Bay Nickel Corp., Palawan	13	June 29 – July 3	Company-sponsored
Safety in the Use of Nuclear Equipment and Devices Training Course – 34th session	Filminera Resources Corp., Masbate	10	September 24 – 30	Company-sponsored
Radiation Safety Officer Training Course	PNRI	9	October 5 – 16	Individual fee-paying
Safety in the Use of Nuclear Equipment and Devices Training Course – 35th session	PNRI	20	October 19 – 23	Individual fee-paying
NUCLEAR POWER				
Introduction to Nuclear Power – 1st session	PNRI	39	January 19 – 21	PNRI-sponsored
Introduction to Nuclear Power – 2nd session	PNRI	30	February 9 – 11	PNRI-sponsored
Introduction to Nuclear Power – 3rd session	PNRI	29	February 16 – 18	PNRI-sponsored
Introduction to Nuclear Power – 4th session	PNRI	21	February 23 – 25	PNRI-sponsored
Introduction to Nuclear Engineering – 1st session	PNRI	32	June 15 – 26	Company-sponsored
Introduction to Nuclear Power – 5th session	PNRI	32	October 12 – 14	PNRI-sponsored
Introduction to Nuclear Engineering – 2nd session	PNRI	28	November 9 – 20	Company-sponsored
NONDESTRUCTIVE TESTING COURSES – in cooperation with the Philippine Society for Nondestructive Testing, Inc. (PSNT)				
Ultrasonic Testing – Level 2	PNRI	28	January 19 – 30	Individual fee-paying
Radiographic Testing – Level 2	PNRI	25	February 2 – 13	Individual fee-paying
Surface Methods – Level 2	PNRI	20	March 2 – 13	Individual fee-paying
Eddy Current Testing – Level 2	PNRI	9	March 16 – 27	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	41	April 13 – 24	Individual fee-paying
Radiographic Testing – Level 2	PNRI	53	May 18 – 29	Individual fee-paying
Radiographic Interpretation	PNRI	12	June 2 – 4	Individual fee-paying
Surface Methods – Level 2	PNRI	25	June 15 – 26	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	26	July 6 – 17	Individual fee-paying
Ultrasonic Testing – Level 2	PNRI	20	July 8 – 21	Individual fee-paying
Eddy Current Testing – Levels 2 & 3	PNRI	9	August 3 – 17	Individual fee-paying
Surface Methods – Level 2	PNRI	6	August 3 – 17	Individual fee-paying
Radiographic Testing – Level 2	PNRI	38	August 17 – September 2	Individual fee-paying
Surface Methods – Levels 2 & 3	PNRI	40	October 12 – 23	Individual fee-paying

Ultrasonic Testing – Level 2	PNRI	39	November 9 – 20	Individual fee-paying
Radiographic Testing – Level 2	PNRI	43	December 7 – 18	Individual fee-paying
WELDING TECHNOLOGY COURSES – in cooperation with the PSNT				
Welding Inspectors' Course	PNRI	11	May 4 – 8	Individual fee-paying
Welding Inspectors' Course	PNRI	6	July 22 – 29	Individual fee-paying
Welding Inspectors' Course	PNRI	8	October 5 – 9	Individual fee-paying

TABLE 2. NUCLEAR S & T TRAINING FOR UNDERGRADUATES

FIELD OF TRAINING	PNRI SECTION/UNIT	SCHOOL	COURSE	NO. OF STUDENTS
ON-THE-JOB TRAINING				
Program development for recording, monitoring and retrieving documents; Administrative services activities	Office of the Director; Technical Assistance Unit; Atomic Research Division; Finance and Administrative Division; Nuclear Services and Training Division; Information Services; Computer Services	Asian Institute of Computer Studies; Institute of Creative Computer Technology; National College of Business Administration; St. Claire College of Caloocan; STI; New Era University; AMA Computer Learning Center	BS Computer Science; BS Accountancy; BS Information Technology; BS Psychology; BS Biology; Diploma in Software Development	21
Basic orchid breeding and culture; Radiosensitivity study on ornamental plants; Cultural practices and plant propagation; Tissue culture and mutation induction	Agricultural Research Group	Philippine Normal University; Philippine Science High School– Bicol Region; Bulacan State University (BSU); Rizal Technological University; University of the Philippines– Diliman	BS Biology for Teachers; BS Biology; High School	14
Microbiological techniques Cytogenetics	Biomedical Research Group	Pamantasan ng Lungsod ng Maynila; Pampanga Agricultural College; BSU	BS Biology, BS Chemistry	5
Marine radioactivity monitoring; Nuclear techniques in environmental studies	Health Physics Research Group	Technological University of the Philippines; Rizal Technological University	BAS-Environmental Science; BS Biology	6
Studies on paralytic shellfish poisoning (PSP); Erosion/ Sedimentation; Microbial analyses of hydrogels	Chemistry Research Group	University of the Philippines (UP) –Visayas; UP-Diliman	BS Chemistry	7
Air pollution studies	Analytical Measurements Research Group	Philippine Science High School -Main; Rizal Technological University	High School BS Biology	4
Development and applications of X-ray spectroscopic techniques	Applied Physics Research Group	Eulogio Amang Rodriguez Institute of Science and Technology	BS Applied Physics	3
Preparation of geological samples for XRF analysis	Nuclear Materials Research Group	University of the Philippines-Diliman	BS Chemistry	1
Personnel monitoring; Area monitoring; Calibration/ maintenance of radiological equipment	Radiation Protection Services	Polytechnic University of the Philippines	BS Physics	2
Nuclear Science and Technology	Nuclear Training Center	BSU	BS Biology	1
				TOTAL: 64

TABLE 3. THESIS/RESEARCH ADVISORSHIP

FIELD OF TRAINING	PNRI SECTION/UNIT	SCHOOL	COURSE	NO. OF STUDENTS
Fabrication of radiation sources for educational purposes from naturally occurring radioactive material (NORM)	Radiation Protection Services	Polytechnic University of the Philippines (PUP)	BS Physics	4
Nuclear physics research	Analytical Measurements Research Group	PUP	BS Physics	5
				TOTAL: 9

TABLE 4. IAEA RESEARCH CONTRACTS*

CLIENT		TITLE/DESCRIPTION OF RESEARCH	PROJECT DURATION		NAME OF RESPONSIBLE AGENCY STAFF	PROJECT COST (IN PESOS)
NAME OF BUSINESS/ ORGANIZATION	NAME/TEL. NO./ E-MAIL OF CONTACT PERSON		START	END		
IAEA	Teresa Benson Tel:(431) 2600-21568	Radiation Processed Materials from Carrageenan for Agricultural Applications	08-27-2009	08-26-2010	Lucille V.Abad lvabad@pnri.dost.gov.ph	Php 236,000.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Applications of Radiotracer and Radioassay Technologies in Paralytic Shellfish Poisoning Risk Analysis	11-05-2009	11-04-2010	Elvira Z. Sombrito ezombrito@pnri.dost.gov.ph	295,000.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Establishment of Early Rapid Detection System for Highly Pathogenic Avian Influenza	09-08-2009	09-07-2010	Cristina Legaspi PAHC	495,000.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Assessment of Impact of Agricultural Pesticides on Water Quality of Laguna de Bay	03-12-2009	12-02 2010	L. Varca National Crop Protection Center	295,000.00
IAEA	Teresa Benson Tel:(431) 2600-21568	The Use of FDG-PET vs. Conventional Diagnostic Tests in the Diagnosis, Staging & Monitoring Response to Treatment and Relapse in Patients with Diffuse Large B-Cell Lymphoma	12-14-2009	12-13 2010	Charity Gorospe St. Lukes Medical Center	590,000.00
IAEA	Teresa Benson Tel:(431) 2600-21568	Molecular Marker Techniques for Selection of Mutant Bananas with Improved Post-Harvest Qualities	12-14-2009	12-13-2010	Emma Sales University of Southern Mindanao	377,600.00

TOTAL: Php 2,288,600.00

*IAEA Research Contracts are grants under the IAEA Research Contract Programme whose funding is sourced from the IAEA Regular Budget and also from extrabudgetary contributions to the IAEA. Through this program, minor equipment and miscellaneous local purchases are provided. The grant to a project is of the average US Dollar 5,000 (convert to euro) per year.

TABLE 5. IAEA TECHNICAL COOPERATION PROJECTS*

CLIENT		TITLE/DESCRIPTION OF RESEARCH	PROJECT DURATION		PROJECT COST (IN PESOS)
NAME OF IMPLEMENTING AGENCY	NAME/TEL. NO./ E-MAIL OF CONTACT PERSON		START	END	
IAEA	Corazon C. Bernido ccbernido@pnri.dost.gov.ph	Human Resource Development and Nuclear Technology Support	2007	2009	Php 1,021, 714.90
IAEA	Neil Raymond D. Guillermo nrdguillermo@pnri.dost.gov.ph	Establishment of a National Nuclear and Radioanalytical Measurements Centre	2007	2010	2,306,761.60
IAEA	Leonardo S.Leopando l Leopando@pnri.dost.gov.ph	Support for the Preparation of a Decommissioning Plan for the Philippine Research Reactor	2007	2011	1,976,050.70
IAEA	Leonardo S. Leopando l Leopando@pnri.dost.gov.ph	Support for the Completion and Implementation of the Decommissioning Plan for the Philippine Research Reactor	2009	2011	1,365,117.00

IAEA	Maria Visitacion B. Palattao mvbpalattao@pnri.dost.gov.ph	Conducting a Study and Evaluation of the Co-Location of a Borehole Disposal Concept with a Proposed Near-Surface Radioactive Waste Repository	2009	2009	1,810,926.00
IAEA	Luvimina G. Lanuza lglanuza@pnri.dost.gov.ph	Upgrading the Gamma Irradiation Facility	2005	2011	11,118,642.60
IAEA	Estrella S. Caseria escaseria@pnri.dost.gov.ph	Upgrading the Philippine Nuclear Research Institute Secondary Standards Dosimetry Laboratory (SSDL)	2009	2011	1,661,400.00
IAEA	Adelina DM. Bulos ambulos@pnri.dost.gov.ph	Setting Up a Facility for the Production of Molybdenum-99/Technetium-99m Generators	2009	2011	9,696,115.00
IAEA	Soledad S. Castañeda sscastaneda@pnri.dost.gov.ph	Isotope Applications in Improving Water Resource Management and Protection	2005	2010	423,841.60
IAEA	Luvimina G. Lanuza lglanuza@pnri.dost.gov.ph	Establishing an Electron Beam Facility	2009	2011	9,137,700.00

TOTAL: Php 40,518,269.40

* Technical Cooperation (TC) Projects are under the IAEA Technical Cooperation Programs and are funded by the Technical Assistance Committee Fund (TACF) and extra budgetary contributions to the IAEA. Financial support is provided in the form of three components, namely, expert assistance, equipment donation and overseas training.

TABLE 6. INTERNATIONAL SCIENTIFIC LINKAGES AND NETWORKS

SCIENTIFIC INSTITUTION		NATURE/DESCRIPTION OF SCIENTIFIC LINKAGES	DATES OF ENGAGEMENT	
NAME OF INSTITUTION/COUNTRY	NAME/E-MAIL/POSITION OF CONTACT PERSON		START	END
International Atomic Energy Agency (IAEA)/ Vienna, Austria	Thru PNRI as the National Competent Authority on nuclear-related matters Contact Person: Alumanda M. dela Rosa, PhD. Director, PNRI	Technical cooperation program (including national technical cooperation projects, research contracts, regional RCA and non-RCA projects, interregional projects)	1958	Present
Regional Cooperative Agreement and Training Related to Nuclear Science and Technology (RCA) for Asia and the Pacific/ Vienna, Austria	Thru PNRI	Regional projects, provision of training and experts, and minimal equipment/supplies	1972	Present
RCA Regional Office/ Korea	Thru PNRI	Regional projects; provision of training and education	2002	Present
Forum for Nuclear cooperation in Asia (FNCA)/Japan	Thru PNRI	Regional projects	2000	Present
Comprehensive Nuclear Test Ban Treaty Organization (CTBTO)	Thru PNRI	Establishment/maintenance of international monitoring stations and data center; provision of training	1999	Present
Australian Nuclear Science and Technology Organization (ANSTO)	Thru PNRI	Regional project, expert and training provision	2006	Present
United States Department of Energy	Thru PNRI	Project; expert; equipment; and training provision	2005	Present
Ministry of Science, Technology, Education, Culture and Sports/ Japan	Thru PNRI	Nuclear researchers exchange program	1985	Present
Nuclear Safety Research Association (NSRA)	Thru PNRI	Expert dispatch and training provision	2004	Present

Other Organizations from Australia, Japan, Canada, United States, Korea and other countries through bilateral agreements/institute agreements	Thru PNRI	Bilateral agreement
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TABLE 7. IAEA EXPERTS/OTHER MISSIONS

FIELD/PURPOSE	NAME OF EXPERT/MISSION	DATE OF VISIT
• RN 52 (CTBTO Radionuclide Monitoring Station in Tanay, Rizal)	Robert Werzi (CTBTO)	January
• Estimating Cost for Decommissioning	Paul Dinner and Vladimir Daniska	February
• Safety Assessment of Low Level Waste Facilities	Dirk Mallants	2 – 6 March
• Safety Assessment of Near Surface Radioactive Waste Disposal Facility	Dirk Mallants	28 Aug– 4 Sept.
• Information Management System (IMS)	Eddie Peramon and Anne Kerrhoas	2 – 6 March
• Regulatory Aspects of Philippine Research Reactor –I Decommissioning	Andrij Stritar	16– 20 March
• European Mission	Gordon Linsley, Francois Ruel, Jean-Paul Joulia, Camilla Hagstrom	26 March
• European Mission	Raffaele di Sapia	28 April
• Country Project Framework, Technical Cooperation Projects	Mokdad Maksoudi	13 May
• Project Review	Reyad Kamel	18-22 May
• Audit of RCA Projects	Michael Ridder and Karl-Heinz Puetz	24-26 Aug
• TC-99m Generator Technology	Azizul Haque	26-30 Oct

TABLE 8. PNRI HOSTINGS

FIELD	PHILIPPINE PARTICIPANT	AGENCY/ INSTITUTE	ORGANIZER/S	VENUE	DATE
• Workshop on Emergency Response – Off-Site Liaison with On-Site and Annual Meeting of the EPRTG	Eulinia M. Valdezco Teofilo V. Leonin, Jr.	PNRI	IAEA	Crowne Plaza Galleria Manila	27 – 31 July '09
• RCA/UNDP Project Final Review Meeting on Post-Tsunami Environment Impact Assessment	Elvira Z. Sombrero (Course Coordinator), Lucille V. Abad, Grace M. Carlos, Ryan Olivares Efrén Sta. Maria	PNRI	RCARO	Manila Pavilion	20 – 23 Oct '09
• Regional Training Course on Therapeutic Radiopharmaceutical Production, QA/QC and Implementation of GMP	Dr. Teofilo O.L. San Luis (Course Director) Dr. G. Goco and M. Acena Ma. Visitacion B. Palattao Pia Rose Belarmino and Pauline Joy Trompeta	PNRI GSM Assurance Bureau of Food and Drugs	IAEA	Manila Pavilion	19 – 23 Oct '09
• 2009 FNCA Project Leaders Meeting on Public Information of Nuclear Energy	Rhodora R. Leonin (Project Leader), Observers: Justina S. Cerbolles, Ma. Celerina M. Ramiro, Grace M. Carlos	PNRI	MEXT, Japan and DOST thru PNRI	Crowne Plaza Galleria Manila	7 – 11 Dec '09
• R ² D ² P Workshop on Cost Estimates	Leonardo S. Leopando, Flora L. Santos, Teofilo V. Leonin, Jr., Vangeline K. Parami, Mylene M. Espinal, Lopito A. Caluag, John M. Marquez, Kristine Marie D. Romallosa	PNRI	IAEA	Manila	30 March – 3 April '09

• Regional Training Course on Nuclear Management for National Infrastructure Development	Vangeline K. Parami, Victoria Fe O. Medina, Roel A. Loterina Observers: Dr. Graceta DL. Cuevas, Grace M. Carlos	PNRI	IAEA	Crowne Plaza Galleria Manila	10 – 18 March '09
• RAS/7015 Technical Meeting on Review and Optimization of the Regional Database	Flora L. Santos (Meeting Coordinator), Preciosa B. Pabroa	PNRI	IAEA	Tagaytay City, Philippines	8 – 12 June '09
• IAEA/RCA Midterm Progress Review Meeting on Sustainability of Regional Radiation Protection Infrastructure	Eulinia M. Valdezco	PNRI	IAEA	Crowne Plaza Galleria Manila	9 – 13 Feb '09

TABLE 9. NON PNRI HUMAN RESOURCES DEVELOPMENT (FOREIGN)

FIELD	NAME	AGENCY	TRAINING VENUE	DATE	SPONSOR
TRAINING COURSE					
• Advanced Clinical Applications of PET	Jonas Francisco Santiago and Roy Vizcarra	St. Luke's Medical Center	Japan	20– 24 April '09	IAEA
• Use of the New DAT Modules	Orestes Monzon	Philippine Heart Center	Singapore	24 – 27 March '09	IAEA
• E- Training on Message, Model for Elaborating Sustainable Energy Strategies, Knowledge Management and Methods for Competency in Nuclear Safety	Joy Castro Corazon Macaraeg Urbano Mendiola	National Economic Development Authority National Power Corporation	Korea	16 – 17 Feb '09	IAEA
• Safety Assessment for Radioactive Waste Disposal Facilities	Dr. Mario Aurelio	UP- National Institute of Geological Sciences	Korea	13 – 27 July '09	IAEA
• Quality Management of Positron Emission Tomography (PET)	Dr. Marie Rhiamar Gomez	Dela Salle University Medical Center	China	31 Aug – 4 Sept '09	IAEA
• Regional Training Course on Application of Nuclear and Stable Isotope Tracers to Determine the Fate and Behavior of Nuclear Contaminants in Marine Systems	Dr. Roque Ulep	Mariano Marcos State University	Indonesia	11- 22 May '09	IAEA
• Regional Training Course on Establishment of Dose Response and Risk Assessment for Marine Organism from Contaminants Released from Nuclear Activities	Dr. Roque Ulep	Mariano Marcos State University	Monaco	2 – 13 Nov '09	IAEA
• Training Course on Safety Assessment for Radioactive Waste Disposal Facilities	Mario Juan Aurelio	National Institute of Geological Sciences – UP Diliman	Korea	13 – 17 July '09	IAEA
• Regional Training Course on State Systems of Accounting for and Control of Nuclear Materials	Johnny B. Tolentino	National Power Corporation	Japan	16 – 26 Nov '09	IAEA
SEMINAR/WORKSHOP					
• Regional Workshop for Sharing Experience in the Application of Knowledge Management	Serafin Farley Meneses	National Power Corporation	Bangladesh	22 – 26 March '09	IAEA
• CTBTO Regional Workshop on Capacity Building	Engr. Arnaldo A. Melosantos	PHIVOLCS	Thailand	23 – 24 Nov '09	IAEA
• Public Information Seminar on Nuclear Power	Michael Sinacruz	Department of Energy	Malaysia	9 – 11 Nov '09	IAEA
• Workshop on Human Resources Management and Knowledge Transition for Nuclear Power Plant	Michael Sinacruz	Department of Energy	Malaysia	2 – 4 July '09	IAEA

• Workshop on Infrastructures Needed for Off-Site and On-Site Emergency Preparedness and Response Activity and on-Medical Treatment	Dr. Consolacion Obmerga	Rizal Medical Center	Malaysia	16 – 20 Nov '09	IAEA
• Workshop on Public Communication Programme	Dennis Gana Carina Montevirgen	National Power Corporation STII-DOST	China	23 – 27 Nov '09	IAEA
• International Workshop on Justification of Medical Exposure in Diagnostic Imaging	Agnette P. Peralta	Bureau of Health Devices of Technology - Department of Health	Belgium	2 - 4 September 2009	IAEA

MEETING

• Final Progress Review Meeting for the Project on Improvement in Quality Assurance for Brachytherapy of Frequent Cancers in the Regions	Miriam Joy Calaguas	St. Luke's Medical Center & Jose Reyes Memorial Medical Center	India	9 – 13 February '09	IAEA
• Mid-Term Progress Review Meeting of the RCA Project on Strengthening Clinical Applications of PET	Roy Vizcarra	St. Luke's Medical Center	Vietnam	22 – 25 Sept '09	IAEA
• Second Meeting of the Nuclear Safety Strategy Dialogue	Raul C. Sabularse	Philippine Council for Industry and Energy Research Development - DOST	Korea	10 April '09	IAEA

TABLE 10. PNRI HUMAN RESOURCES DEVELOPMENT (FOREIGN)

FIELD	NAME	TRAINING VENUE	DATE	SPONSOR
ON-THE-JOB TRAINING				
Special OJT Course for Regulatory Inspection of Nuclear Power Plant Under Construction	Alfonso A. Singayan Teresita G. De Jesus	Korea	19 – 30 Oct '09	IAEA
Marine Environmental and Coastal Zone Management	Rhett Simon DC. Tabbada	Monaco	15 Sept – 14 March '09	IAEA
TRAINING COURSE				
• Reactor Plant Safety Course	Rolando Y. Reyes	Japan	19 Jan -13 Feb '09	MEXT
• Security in the Transport of Radioactive Material	Ma. Teresa A. Salabit Edgar G. Racho Teresita G. De Jesus	Australia	9 – 13 Feb '09	IAEA
• Training Programme on Regulatory Infrastructure for Radiation and Waste Safety	Alfonso A. Singayan	Malaysia	16 Feb – 16 May '09	IAEA
• Mutation Breeding Approaches to Improving Protein and Starch Quality	Mary Jayne C. Manrique	Australia	23 – 27 March '09	IAEA
• Physical Protection of Nuclear Material and Nuclear Facilities	Arnaldo R. Valenzuela	India	6 – 17 April '09	IAEA
• Using Back Trajectory Schemes to Link Pollution Transport Across the Region and Beyond	Preciosa Corazon B. Pabroa	Mongolia	4 – 8 May '09	IAEA
• Application of Nuclear and Stable Isotope Tracers to Determine the Fate and Behavior of Nuclear Contaminants in Marine Systems	Eliza B. Enriquez	Indonesia	11 – 22 May '09	IAEA
• International Training Course on State Systems of Accounting for and Control of Nuclear Material	Nelson P. Badinas	USA	24 May – 5 June '09	IAEA
• Decommissioning of Small Nuclear Facilities	Alan M. Borrás	USA	31 May – 5 June '09	IAEA

• Physical Protection of Nuclear Research Reactors	Virgilio R. Santiago	Australia	15 – 26 June '09	IAEA
• Safety Assessment for Radioactive Waste Disposal Facilities	Rolando Y. Reyes	Korea	13 – 17 July '09	IAEA
• Nuclear Safety Tailored to IAEA Member Countries	Rosita Daroy Alan M. Borrás	Korea	17 – 28 Aug '09	IAEA
• Mutation Breeding Approaches to Improving Disease Resistance	Mary Jayne C. Manrique	India	5 – 9 Oct '09	IAEA
• Regulatory Control for Licensing of New Nuclear Power Plant Projects	Alfonso A. Singayan Teresita G. De Jesus	Korea	12 – 16 Oct '09	IAEA
• Technical Training Programme for Radionuclide Station Operators on Canberra Equipment	Fe M. Dela Cruz	USA	13 – 30 Oct '09	IAEA
• Nuclear Material Accounting and Control at Facilities	Edgar G. Racho	China	14 – 30 Oct '09	IAEA
• Advanced School on In-Situ X-Ray Fluorescence and Gamma Ray Spectrometry	Ryan P. Morco	Italy	26 – 30 Oct '09	ICTP
• Regional Training Course on Digital Industrial Radiography and Computed Tomography Applications in Industry	Percedita T. Cansino	Malaysia	2 – 6 Nov '09	IAEA
• Establishment of Quality Management Programmes Applicable to All Technical Services	Estrella S. Caseria	Bangladesh	6 – 10 Dec '09	IAEA
• Quality Control and Quality Assurance of Radiation Facility Operation and Dosimetry	Charito T. Aranilla	India	7 – 11 Dec '09	IAEA
• RAS/7016 Regional Training Course on Establishment of Dose Response and Risk Assessment for Marine Organisms from Contaminants Released from Nuclear Activities	Lorna Jean H. Palad	Monaco	2 – 13 Nov '09	IAEA
• Regional Training Course on Quality Control and Quality Assurance of Radiation Facility Operation and Dosimetry	Ma. Teresa L. Borrás	India	7 – 11 Dec '09	IAEA

SEMINAR/WORKSHOP

• International Workshop on Sustainable Management of Disused Sealed Radioactive Sources	Editha A. Marcelo Ma. Visitacion B. Palattao	Thailand	1 – 12 Jan '09	IAEA
• Regional Workshop for Sharing Experience In the Application of Knowledge Management	Luzviminda L. Venida	Bangladesh	22 – 26 March '09	IAEA
• Seminar on Radiation Incidents: Avoidance, Surveillance and Response and a Table-Top Exercise	Flora L. Santos	Australia	7 – 8 May '09	Australian Dept. of Foreign Affairs & Trade
• Asia Regional Technical Workshop on the Megaports Initiative	Julietta E. Seguis	Thailand	12 – 15 May '09	USA Govt.
• Workshop on Safety Management and Verification for Research Reactors and the Annual Meeting of the Safety Management Research Reactors Topical Group	Vangelina K. Parami Carl M. Nohay	Vietnam	18 – 22 May '09	IAEA
• Workshop on Human Resources Development Project of the Forum for Nuclear Cooperation in Asia	Percedita T. Cansino	Japan	22 – 25 June '09	MEXT
• Workshop on Human Resources Management and Knowledge Transition for Nuclear Power Plant Projects	Nydia C. Medina	Malaysia	2 – 4 July '09	IAEA
• Research Reactor Decommissioning Demonstration Activities: Decommissioning Technologies Workshop	Lopito A. Caluag Kristine Marie D. Romalosa	Germany	6 – 10 July '09	IAEA
• Workshop on RCARO Partnership Promotion and Sustainable Development	Alumanda M. Dela Rosa	Korea	7 – 9 July '09	RCARO
• Regional Workshop on the Planning and Execution of Dismantlement for Research Reactors and Other Small Facilities	John M. Marquez	Australia	20 – 24 July '09	IAEA

• Workshop on Radiation Safety and Radioactive Waste Management Project	Ma. Visitacion B. Palattao	Vietnam	3–7 Aug '09	Govt of Japan
• Physical Protection and Security Management of Sources: Train The Trainer Workshop	Julietta E. Seguis, Thelma P. Artificio, Alan M. Borrás Lynette B. Cayabo, Nelson P. Badinas	Australia	10–14 Aug '09	ANSTO
• Workshop on Training Needs Assessment and the Annual Meeting of the Education and Training Topical Group (ETTG)	Corazon C. Bernido	Austria	10–14 Aug '09	IAEA
• Workshop on Training Needs Assessment	Corazon Garcia	Austria	12–14 Aug '09	IAEA
• Strategic Planning and Regional Networking for Sustainability	Pablo P. Saligan	Australia	12–14 Aug '09	IAEA
• FNCA Workshop on Research Reactor Utilization	Preciosa Corazon B. Pabroa	Japan	7–11 Sept '09	MEXT
• FNCA Workshop on Mutation Breeding	Alfonso O. Grafia	China	20–25 Sept '09	NSRA
• Workshop on Lessons Learned from the Last Joint Convention Review Meeting and Annual Meeting of the Radioactive Waste Management Topical Group	Ma. Visitacion B. Palattao Editha A. Marcelo	China	28–30 Sept '09	IAEA
• International Workshop on Nuclear Safety and Security Education and Training in Countries Embarking on or Expanding Nuclear Programmes	Corazon C. Bernido	Italy	8–9 Oct '09	NSSG
• Combating Illicit Trafficking in Nuclear and Other Radioactive Materials	Julietta E. Seguis Sylvia Busine	Malaysia	12–15 Oct '09	IAEA
• Regional Training Workshop on Research Reactor Utilization and Radiation Application Technology	Adelina DM. Bulos Rizalina G. Osorio	Korea	12–23 Oct '09	KAERI
• Regional Workshop on Nuclear Material Accounting and Control at Facilities	Edgar G. Racho	China	14–30 Oct '09	IAEA
• Public Information Seminar on Nuclear Power	Justina S. Cerbolles	Malaysia	9–13 Nov '09	IAEA
• Workshop on Infrastructures Needed for Off-Site and On-Site Emergency Preparedness and Response Activity and on Medical Treatment	Emma L. Cancino	Malaysia	16–20 Nov '09	IAEA
• Workshop on Infrastructures Needed for Off-Site and On-Site Emergency Preparedness and Response Activity and on Medical Treatment; 5th International Workshop on Individual Monitoring of Ionizing Radiation	Estrella S. Caseria	Malaysia Japan	16–29 Nov '09	IAEA
• Workshop on Public Communication Programme Establishment and Management of Nuclear Power Plant Projects	Rhodora R. Leonin	China	23–27 Nov '09	IAEA
• Workshop on Safety Assessment for Predisposal Radioactive Waste Management Facilities	Editha A. Marcelo Luzviminda L. Venida	Thailand	23–27 Nov '09	IAEA
• Workshop on Periodic Safety Review of Research Reactors	Ma. Visitacion B. Palattao Lynette B. Cayabo	Thailand	30 Nov–4 Dec '09	IAEA
• Regional Seminar on Radiation Protection Regulators on Sharing Best Practices in Managing Disused Sources and Networking	Thelma P. Artificio	Indonesia	7–11 Dec '09	IAEA
• Workshop on Experience in Building Up Competence in Nuclear Safety for Countries Embarking on Nuclear Power	Corazon Garcia	Japan	8–11 Dec '09	IAEA
MEETING				
• Final Progress Review Meeting on Sustainable Land Use and Management Strategies	Adelina DM. Bulos	China	19–23 Jan '09	IAEA
• Final Progress Review Meeting on Formulation of Sustainable Energy Development Strategies	Christina A. Petrache	Thailand	26–30 Jan '09	IAEA

• Consultancy Meeting on Comparative Analysis of Methods and Tools for Nuclear Knowledge Preservation	Ana Elena L. Conjares	Austria	2–6 Feb '09	IAEA
• Midterm Progress Review Meeting on Improvement of Crop Quality and Stress Tolerance for Sustainable Crop Production Using Mutation Techniques and Biotechnology	Alfonso O. Grafia Faye Rivera	Vietnam	16–20 Feb '09	IAEA
• International Work Group on Long Term Sustainability of Emergency Preparedness and Response Programmes	Eulinia M. Valdezco	Morocco	16–20 Feb '09	NNSA, USA
• ASEAN Regional Roundtable Discussion on Achieving a Safe and Sustainable Nuclear Future	Alumanda M. Dela Rosa	Singapore	2 March '09	National University of Singapore
• Project Planning Meeting on Supporting Radiation Processing of Polymeric Materials for Agricultural Applications and Environmental Remediation	Lucille V. Abad	Korea	16–20 March '09	IAEA
• Technical Meeting on Practical Implementation of Safety Assessment Methodologies (PRISM) in the Context of Safety Case for Near-Surface Facility	Ma. Visitacion B. Palattao	Austria	30 March – 3 April '09	IAEA
• Technical Meeting on International Low Level Waste Disposal Network (Disponet)	Ma. Visitacion B. Palattao	Austria	15–17 April '09	IAEA
• International Radioactive Waste Technical Committee Meeting	Alumanda M. dela Rosa	Austria	31 March – 3 April '09	IAEA
• Second Meeting of Nuclear Strategy Dialogue of the Asian Nuclear Safety Network	Alumanda M. Dela Rosa	Korea	10 April '09	IAEA
• RCM on Strengthening National and Regional Capabilities for Response to Radiological and Nuclear Emergencies	Teofilo V. Leonin, Jr.	Malaysia	13–17 April 09	IAEA
• Meeting of Standing Advisory Committee	Alumanda M. Dela Rosa	Japan	20 April 09	Philippine Gov't
• 31st Meeting of National RCA Representatives	Alumanda M. Dela Rosa	Japan	21–23 April '09	Philippine Gov't
• Midterm Progress Review Meeting on Establishing a Benchmark for Assessing the Radiological Impact of Nuclear Power Activities on the Marine Environment in the Asia-Pacific Region	Eliza B. Enriquez	India	20–24 April '09	IAEA
• Final Progress Review Meeting on Development and Application of Advanced Industrial Radiography and Tomography Techniques	Renato T. Bañaga	Indonesia	20–25 April '09	IAEA
• 36th Session of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection	Elvira Z. Sombrito	Switzerland	27 April – 1 May '09	IMO
• Project Planning Meeting on Irradiation for Enhanced Sanitary and Phytosanitary Treatment of Regional Products for Export	Zenaida M. De Guzman	India	4–8 May '09	IAEA
• Third Regional Technical Meeting on Additional Protocol Implementation in Asia and the Pacific Region	Sylvia S. Busine	Korea	11–15 May '09	IAEA
• 9th Meeting of the Steering Committee of the Asian Nuclear Safety Network	Corazon C. Bernido	Indonesia	12–14 May '09	IAEA
• IAEA Board of Governors Meeting	Alumanda M. Dela Rosa	Austria	15–19 June '09	Philippine Gov't
• Technical Meeting on National Approaches and Strategies for Nuclear Knowledge Management	Corazon C. Bernido	Austria	15–19 June '09	IAEA
• Planning Meeting on Harmonizing Nuclear and Isotopic Technique for Marine Pollution Management	Elvira Z. Sombrito	Malaysia	22–26 June '09	IAEA
• Midterm Progress Review Meeting on Novel Applications of Food Irradiation Technology for Improving Socio-Economic Development	Zenaida M. De Guzman	Australia	6–10 July '09	IAEA
• Review of Nuclear Educational Programmes in RAS//0/047 Participating Countries	Corazon C. Bernido	Malaysia	6–10 July '09	IAEA

• Executive Technical Meeting on Asia Dust Events and Source Profiles	Preciosa Corazon B. Pabroa	Korea	13– 17 July '09	IAEA
• 1st Meeting of Study Panel on Approaches Toward Infrastructure Development for Nuclear Power	Alumanda M. Dela Rosa	Japan	30 – 31 July '09	Cabinet Office Japan
• Progress Review Meeting on Characterization and Source Identification of Particulate Air Pollution in the Asian Region	Flora L. Santos	Indonesia	10 – 14 Aug '09	IAEA
• 33rd Working Group B Meeting of the Preparatory Commission of the Comprehensive Nuclear Test Ban Treaty Organization	Teofilo Y. Garcia	Austria	17 Aug – 4 Sept '09	CTBTO
• Technical Meeting on Implementation of Total Quality Management System Guidelines for Monitoring the Impacts of Nuclear Power Activities on the Marine Environment	Teofilo Y. Garcia	Vietnam	7 – 11 Sept '09	IAEA
• Board of Governors Meeting	Alumanda M. Dela Rosa	Austria	7 – 9 Sept '09	Philippine Gov't.
• Senior Regulators Meeting	Alumanda M. Dela Rosa	Austria	17 Sept '09	Philippine Gov't.
• Final Research Coordination Meeting of the CRP on Improving Sterile Male Performance in Fruit Fly SIT Programmes	Glenda B. Obra Sotero Resilva	Mauritius	21 – 25 Sept '09	IAEA
• Development of a Work Plan for Project Implementation	Alumanda M. Dela Rosa Elvira Z. Sombrito Luvimina G. Lanuza	Austria	28 Sept – 2 Oct '09	IAEA
• Technical Meeting on Regulatory Oversight of Licensees' Activities During Major Nuclear Power Plant Projects	Teofilo V. Leonin, Jr.	Austria	28 Sept – 2 Oct '09	IAEA
• Information Technology Support Group Meeting	Angel B. Anden	Japan	30 Sept – 2 Oct '09	IAEA
• 2nd Technical Meeting on Development of Radiation Processed Products of Natural Polymers for Application in Agriculture, Healthcare, Industry, and Environment	Lucille V. Abad	France	12 – 16 Oct '09	IAEA
• 10th Meeting of the Steering Committee of the ANSN	Corazon Garcia	Singapore	20 – 22 Oct '09	IAEA
• 2nd International Meeting on Next Generation Safeguards	Julietta E. Seguis	Japan	26 – 28 Oct '09	IAEA
• Project Coordinators Meeting on Strengthening Nuclear Regulatory Authorities in the Asia Pacific Region	Alan M. Borrás	United Arab Emirates	27 – 29 Oct '09	IAEA
• National Coordinators Meeting and Regional Workshop on Cyber Learning	Corazon C. Bernido	United Arab Emirates	8 – 12 Nov '09	IAEA
• 6th Meeting of the Working Group on Long Term Sustainability of Emergency Preparedness and Response Programme	Eulinia M. Valdezco	Austria	9 – 11 Sept '09	IAEA
• Midterm Review Meeting on Assessing Trends in Freshwater Quality Using Environmental Isotopes and Chemical Techniques for Improved Resource Management	Soledad S. Castañeda	China	16 – 20 Nov '09	IAEA
• Technical Meeting on Nuclear Security Objectives and Fundamental Principles	Julietta E. Seguis	Austria	16 – 20 Nov '09	IAEA
• Technical Meeting on Industrial Compatibility, Maintenance and Calibration of Equipment for Industrial Radiotracer	Denis DC. Aquino	Vietnam	7 – 11 Dec '09	IAEA
• National Liaison Officers (NLO) Meeting	Alumanda M. Dela Rosa Nydia C. Medina	Austria	9 – 11 Dec '09	IAEA
• RCM on Strengthening National Regulatory Infrastructure for the Control of Radiation Sources	Teofilo V. Leonin, Jr.	Jordan	13 – 17 Dec '09	IAEA
• 10th Ministerial Level Meeting and Senior Officials Meeting of the Forum for Nuclear Cooperation in Asia (FNCA)	Corazon C. Bernido	Japan	15 – 16 Dec '09	Cabinet Office of Japan
• Illicit Trafficking Database Point of Contacts Meeting	Julietta E. Seguis	Austria	16 – 18 Dec '09	IAEA

CONFERENCE/CONGRESS/ SYMPOSIUM/FORUM				
• International Conference on Control and Management of Inadvertent Radioactive Material In Scrap Metal	Eulinia M. Valdezco	Spain	23– 27 Feb '09	IAEA
• International Ministerial Conference on Nuclear Energy in the 21st Century	Corazon C. Bernido	China	20 – 22 April '09	IAEA
• Safety Forum on How to Strengthen the Safety Assessment Capability for Design and Operation of Nuclear Power Plants	Christina A. Petrache Ma. Visitacion B. Palattao	Korea	20 – 22 May	IAEA
• International Scientific Studies 2009 Conference	Alumanda M. Dela Rosa	Austria	10 – 12 June '09	CTBTO
• International Symposium on the Research and Educational Network for Nuclear Power Among Industry, Academia and Government in Asia	Alumanda M. Dela Rosa	Japan	15 – 18 July '09	JSPS
• Speaker: Bien 2009- International Network of Women Engineers and Scientists (Asian Network)	Alumanda M. Dela Rosa	Korea	27 – 29 Aug '09	KWSE
• 38th RCA General Conference	Alumanda M. Dela Rosa	Austria	11 Sept '09	Philippine Gov't.
• 53rd Regular Session of the IAEA General Conference	Alumanda M. Dela Rosa	Austria	14 – 18 Sept '09	Philippine Gov't.
• International Conference on Socioeconomic and Environmental Impact Assessment of Biotech Crops	Vangelina K. Parami	Thailand	29 – 30 Sept '09	DOST-GIA
• International Conference on Knowledge Management In Agribiotechnology	Vangelina K. Parami	Thailand	1 – 2 Oct '09	DOST-GIA
• International Symposium and Annual Meeting on Food Science and Nutrition	Zenaida M. De Guzman	Korea	4 – 6 Nov '09	KAERI; (KFN)
• International Conference on Effective Nuclear Regulatory Systems: Further Enhancing the Global Nuclear Safety and Security Regime	Alumanda M. Dela Rosa	South Africa	14 – 18 Dec '09	IAEA
SCIENTIFIC VISIT/EXPERT MISSION/CONSULTANCY				
• Management and Quality Assurance of Isotope Hydrology Laboratory	Soledad S. Castañeda	Vietnam	11 – 23 Jan '09	IAEA
• Radiation Processing Facilities and Applications	Zenaida M. De Guzman	United Kingdom	27– 29 Jan '09	IAEA
• Consultant–To Prepare Final Version of the Training programme on Compliance Assurance for Safe Transport of Radioactive Material	Vangelina K. Parami	Austria	20 – 24 July '09'	IAEA
• Scientific Visit - Radiation Processing Facilities and Applications	Luvimina G. Lanuza	Romania; Poland	12 – 23 Oct '09	IAEA
• Scientific Visit to Observe the Electron Beam Irradiation Facilities in Two Institutes in Malaysia and Korea	Arturo F. Salih	Malaysia	19 – 23 Oct '09	IAEA
• Scientific Visit to Different Irradiation Facilities in Malaysia and Observe the Latest Radiation Processing	Aurelio Maningas	Malaysia	19 – 23 Oct '09	IAEA
• Scientific Visit to ANSTO and ARPANSA	Neil Raymond D. Guillermo	Australia	30 Nov – 11 Dec '09	IAEA
• National Expert - Country Programme Framework Mission	Elvira Z. Sombrito Ma. Visitacion B. Palattao Victoria Fe O. Medina Nydia C. Medina	Austria	7 – 9 Dec '09	IAEA
NUCLEAR RESEARCHERS EXCHANGE PROGRAM				
• Nuclear Researchers Exchange Program	Carl M. Nohay	Japan	3 Aug '09 – 29 Jan '10	MEXT

• Reactor Physics and Nuclear Engineering	Giuseppe Filam O. Dean	Japan	13 Oct '09 – 30 Sept '10	MEXT
DEGREE COURSE				
• RONPAKU Fellowship (Study Visit)	Lucille V. Abad	Japan	20 – 24 July '09	JSPS

TABLE 11. PNRI HUMAN RESOURCES DEVELOPMENT (LOCAL)

FIELD	NAME	VENUE	DATE
TRAINING			
• Training Principles of Web Development/ W3C Standards/Accessibility, Basic Database Management and Web Security	Christopher G. Halnin	20 – 24 April '09	Advanced Science and Technology Institute
• Website Migration Training (Batch 2)	Christopher G. Halnin, Christine P. Singayan	6 – 9 July '09	Metals Industry Research and Development Center (MIRDC)
• MIRDC In-House Trainings on Quality Management System	Alma S. Piñera Alan M. Borras Luzviminda L. Venida	14 – 16 July '09	MIRDC
• Course on Public Information and Media Relations Skills and Crisis Management	Victoria Fe O. Medina Rhodora R. Leonin Justina S. Cerbolles	29 – 31 July 2009	SEAMEO, Innotech, Quezon City
• Regional Training Course on Therapeutic Radiopharmaceutical Production, QA/QC Implementation of GMP	Ma. Teresa L. Borras	23 Oct '09	Manila Pavilion
• CBRN First Responders Training Program	Ma. Teresa A. Salabit	26 – 29 Oct '09	Camp Crame
• Training on Green Tech- Bootcamp	Michael P. Hernandez	23 – 25 Nov '09	UP Ayala Land
• In-House Training Program on QMR Skills Development and Understanding ISO 9001:2008	Alan M. Borras	14 – 16 Dec '09	MIRDC
Seminar/Workshop			
• PNRI Planning Workshop	Victoria Fe O. Medina, Nydia C. Medina Angel B. Anden, Grace M. Carlos	Feb '09	Kaliraya, Quezon
• Seminar on Internal Audit for ISO/IEC 17025	Flora L. Santos, Soledad S. Castañeda Zenaída M. de Guzman	19 – 20 Feb '09	MIRDC
• ICP Seminar	Flora L. Santos and Soledad S. Castañeda	17 Feb '09	Camp Crame
• Product Launch and Tech Update	Ricky C. Gabinete and Arminda V. Espinosa	4 March '09	Bayview Hotel
• Training/Workshop on the Integrated Management System (IMS)	Victoria Fe O. Medina, Nydia C. Medina, Corazon Garcia, Ma. Luz M. Ascaño, Adelina DM. Bulos, Teofilo Y. Garcia, Neil Raymund D. Guillermo, Vangelina K. Parami, Alan M. Borras, Ma. Visitacion B. Palattao, Rosita R. Daroy, Flora L. Santos, Rhodora R. Leonin Virgilio Santiago, Percedita T. Cansino, Graceta DL. Cuevas, Bernard M. De Lara, Ma. Celerina M. Ramiro, Susan S. Pascual, Virginia S. Calix, Alfonso O. Graña, Soledad S. Castañeda, Eliza B. Enriquez, Eulinia M. Valdezco, Thelma P. Artificio, Julieta E. Seguis, Teofilo V. Leonin, Jr., Carl M. Nohay, Luzviminda L. Venida, Isabel M. Amiscaray, Emma L. Cansino, Josefina J. Omandam, Laura R. Pineda, Alicia F. Lagunzad, Gloriamaris G. Caraos, Celestino M. Santos, Ricky C. Gabinete	3 -5 March '09	PNRI
• Training/Workshop on the Integrated Management System (IMS)	Carolina M. Andres and Luzviminda B. Muyco	3 -5 March '09	PNRI

• DOST Communication Planning Workshop	Justina S. Cerbolles	6 March '09	Citystate Tower, Manila
• Seminar on ISO 9001 2005 Quality Management System Awareness	Joan L. Tugo	5 March '09	DOST
• Workshop on A.O. 255	Emma L. Cancino	5 March '09	Malacañang, Manila
• Test Analysis and Calibration Information System at DOST (TACIS) SAD Workshop	Angel B. Anden	13 March '09	DOST
• ISO/IEC 17025:2005 Awareness Seminar	Gina B. Abrera, Ricky C. Gabinete, Eileen A. Hernandez, Kristine Marie D. Romallosa, Erlinda N. Veracruz	28 March '09	MIRDC
• Legal Seminar for the Biological Weapons Convention (BWC)	Sylvia S. Busine	21 -22 May '09	Department of Foreign Affairs
• One Day Opportunity Summit "4K: Kalinga at Karagadagang Kabuhayan sa Kawaning Gobyerno:	Emma L. Cancino Alicia F. Lagunzad	22 May '09	Philippine Trade and Training Center
• Workshop of the Inter-Agency Core Group on Nuclear Energy	Eulinia M. Valdezco, Christina A. Petrache, Corazon Garcia, Julieta E. Seguis, Vangelina K. Parami, Victoria Fe O. Medina, Ma. Celerina M. Ramiro, Alan M. Borras, Lynette B. Cayabo, Teresita G. De Jesus, Josefina G. Natera, Johnylen V. Melendez	2- 4 Sept '09	National Power Corporation, Bataan
• Enterprise Outreach Awareness Workshop	Eulinia M. Valdezco	18 Sept '09	Makati Shangrila
• Seminar on Industrial Calibration Module I	Ramoncito F. Sulit	13 – 14 Nov '09	Makati City
• Seminar-Workshop on Basic Plant Variety Protection	Ana Maria S. Veluz	16 – 20 Nov '09	Bureau of Plant Industry
MEETING			
• Regional Worker's Consultation	Corazon C. Bernido, Virginia S. Calix, Graceta DL. Cuevas, Flora L. Santos, Eulinia M. Valdezco, Angel B. Anden, Ma. Celerina M. Ramiro	AFP Commissioned Officer Country	13 Jan '09
• 76th NRCP General Assembly	Glenda Obra, Ana Marie Veluz	11 March '09	Manila Hotel
• Review and Finalization of the Proposed GMP Modules	Zenaída M. De Guzman	24 April '09	Philtrade
• 2009 National Biotechnology Week Task Force Meeting & Live-in Planning Workshop	Chitho P. Feliciano	6 – 7 May '09	Laguna
• Seminar- Workshop on Establishing the Calibration Interval of Measuring Devices	Estrella S. Caseria, Ma. Lucia C. Cobar Joseph Michael D. Racho	4-5 Aug '09	MIRDC
• Seminar-Dialogue on the Implementation of COA Circular No. 2009-002	Celestino M. Santos, Virginia B. Millano, Bernard M. De Lara, Ricky C. Gabinete	18 May '09	Comiision on Audit
• Philippine S & T Resource Info System: Software Requirements Specification (SRS) Workshop	Angel B. Anden and Christopher Halnin	12 – 13 Aug '09	ASTI
• Application of Particle Analyzer in the Fields of Pharmaceutical, Food, Cement and Chemical	Elvira Z. Sombrito, Efren Sta. Maria, Jennyvi Dayaon, Anniee Day Asa	18 Aug '09	Jade Palace
• Electric Power Development Workshop	Christina A. Petrache	8 Dec '09	Astoria Plaza
• Workshop on the National Anti-Terrorism Strategy and the Harmonized Crisis Management Manual	Teofilo V. Leonin, Jr and Alan M. Borras	25 – 27 Nov '09	SEAMEO-Innotech
• ISO 17025 Awareness	Celia O. Asaad and Joseph Michael D. Racho	23- 27 Nov '09	MIRDC
• DOST Webmasters Consortium Evaluation and Planning Meeting	Ana Elena L. Conjares	15 – 16 Dec '09	Advanced Science and Technology Institute
OTHERS			

• Food, Environment and Consumer Product Safety Forum	Ma. Teresa L. Borrás	22 July 2009	New World Renaissance Hotel
• Dialogue for the GISIS Member Agency	Graceta DL. Cuevas and Emma L. Cancino	16 July 2009	Government Service Insurance System
• Earth Science International Conference	Raymond J. Suggang and Norman S. Mendoza	27 – 28 Aug 2009	Heritage Hotel
• First National Summit on the Culture and Processing of Shellfishes	Elvira Z. Sombrito and Adelina DM. Bulos	23 -24 sept '09	Asian Fisheries Academy, Pangasinan
• 6th Annual Conference on ISO 9001 Quality Management System (QMS) in Government	Alan M. Borrás, Ma. Celerina M. Ramiro Luzviminda L. Venida	23 Oct '09	Angeles, Pampanga
• 27th Samahang Pisika ng Pilipinas Physics Congress	Kristine Marie D. Romallosa Unico Bautista	28 – 30 Oct '09	Tagaytay City
• DOST Webmaster's Consortium (WMC) Website Migration Bootcamp	Ana Elena L. Conjares	4– 5 Nov. 09	DOST
• National Forum on Climate Change	Christina A. Petrache and Preciosa B. Pabroa	16 Nov '09	Manila Hotel
• 5th National Biotechnology Scientific Forum	Avelina G. Lapade, Ana Marie S. Veluz Mary Jayne C. Manrique, Zenaida M. De Guzman, Chitho P. Feliciano, Ryan U. Olivares	24 Nov '09	Mall of Asia, Pasay City
• East Asian Seas Congress	Elvira Z. Sombrito	23 – 27 Nov '09	Philippine International Convention Center

TABLE 12. PNRI GRADUATE PROGRAM

NAME /ADDRESS / E-MAIL OF SCHOLAR	LEVEL FIELD OF STUDY	NAME OF RECEIVING HIGHER EDUCATIONAL INSTITUTION	STATUS
WITH SCHOLARSHIP			
Lucille V. Abad	Ph. D. in Nuclear Engineering and Management	The University of Tokyo	On-going/Japan Scholarship Program
Ryan U. Olivares	Ph.D. In Environment System	The University of Tokyo	On- Going/Asian Development Bank and Japan Scholarship Program
Preciosa Corazon B. Pabroa	Ph.D. In Environmental Science	University of the Philippines (UP) - Diliman	On-going/Science Education Institute (SEI)
Ryan P. Morco	M.S. in Chemistry	University of Sto. Tomas	On-going/SEI
Joseph Michael D. Racho	M.S. in Chemistry	University of Sto. Tomas	On-going/SEI
SELF-FINANCED STUDIES			
Thelma P. Artificio	Ph.D. in Technology Management	Technological University of the Philippines-Manila	On-going
Soledad S. Castañeda	Ph.D in Environmental Science	UP-Diliman	On-going
Vallerie Ann I. Samson	Ph.D. in Material Science Engineering	University of Tsukuba Monbukagakusho Scholarship	On-going
Chitho P. Feliciano	M.S. Microbiology and Biotechnology	UP-Diliman	On-going
Lorna Jean H. Palad	M.S. Environmental Science	UP-Diliman	On-going
Rhett Simon DC. Tabada	M.S. Marine Science	UP-Diliman	On-going
Denis DC. Aquino	M.S. Engineering	UP-Diliman	On-going

TABLE 14. ADDITIONAL RESOURCES FROM EXTERNAL SOURCES

DONOR NAME OF INSTITUTION	PROJECT TITLE	PROJECT LEADER/ E-MAIL	DESCRIPTION OF ASSISTANCE	VALUE OF ASSISTANCE
A. LOCAL GRANTS-IN-AID				
Department of Science and Technology (DOST)/Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARDD)	Varietal Improvement of Selected Ornamental Crops (Spathoglottis, Orchids, Foliage-type Anthuriums and Hoyas)	Fernando B. Aurigue fbaurigue@pnri.dost.gov.ph	Financing	Php 1,103,071.25
DOST/ PCARRD	Rehabilitation of Plant Nursery	Fernando B. Aurigue fbaurigue@pnri.dost.gov.ph		200,000.00
DOST/ PCARRD	Efficacy of Gamma Radiation for the Sterilization of American Foul Brood (AFB) Infected Materials	Zenaida M. De Guzman zmdeguzman@pnri.dost.gov.ph	Financing	760,366.00
Department of Agriculture/ Bureau of Plant Industry (BPI)	Enhancement of the Export Competitiveness of Philippine Super Mango Program - Project: Establishment of Radiation Dose for Quarantine Treatment of Mango Pulp Weevil	Glenda B. Obra gbobra@pnri.dost.gov.ph	Financing	207,246.00
DOST/ Philippine Council for Aquatic and Marine Research and Development (PCAMRD)	Development of Toxicity Model for Paralytic Shellfish Toxins in Mussels: Uptake and Release of Toxin in Green Bay Mussel	Elvira Z. Sombrito ezombrito@pnri.dost.gov.ph	Financing	1,085,034.97
DOST/PCAMRD	Application of Nuclear Techniques to Address Specific Harmful Algal Concerns: Project 1a, Project 1b and Project 4b	Adelina DM Bulos admbulos@pnri.dost.gov.ph Azucena De Vera advera@pnri.dost.gov.ph	Financing	168,300.00
DOST/PCAMRD	Ecology and Oceanography of Harmful Algal Blooms (HABs) in the Philippines-Project 6: Historical Sedimentation Rate and Radiometric Fingerprinting of Suspended-Sediment in Selected HAB Areas	Efrén D. Sta. Maria edstamaria@pnri.dost.gov.ph	Financing	7,989,005.00
DOST/PCAMRD	Isotope and Nuclear Techniques Application on Water Management and Protection – Proj.1. Isotope Applications in Delineating Recharge of Bacolod City Groundwater System	Soledad S. Castañeda sscastaneda@pnri.dost.gov.ph	Financing	605,227.07
DOST/PCAMRD	Isotope and Nuclear Techniques Application in Water Management and Protection – Project 2. Isotope Applications in Verifying Recharge Processes in Bulacan Province	Soledad S. Castañeda sscastaneda@pnri.dost.gov.ph	Financing	2,528,560.00
COCA-COLA Philippines	Determination of Gross Alpha and Beta, and Radon Activities in Water	Soledad S Castañeda sscastaneda@pnri.dost.gov.ph	Financing	439,500.00
Department of Environment and Natural Resources (DENR)- Environment Management Bureau (EMB)	Monitoring on Smaller Particulates (PM10, PM2.5) and to Determine Principal Sources of Apportionment Pollution	Flora L. Santos flsantos@pnri.dost.gov.ph Preciosa Corazon B. Pabroa pcbpabroa@pnri.dost.gov.ph	Financing	443,000.00
DOST/Philippine Council for Industry and Energy Research and Development (PCIIRD)	National Security of International Cargoes	Julietta E. Seguis jesequis@pnri.dost.gov.ph	Financing	5,000,000.00
DOST/ PCIIRD	Establishment, Implementation and Maintenance of Management Systems in all DOST RDIs and Regional Offices: Project 4: Upgrading of Facilities of DOST RDIs in Support to Research and Development (R & D) and Scientific and Technological (S & T) Services	Ma. Celerina M. Ramiro macramiro@pnri.dost.gov.ph	Financing	25,890,487.88
DOST/PCIIRD	Establishment, Implementation and Maintenance of Laboratory Accreditation in All DOST Laboratories in Accordance with ISO/IEC 17025	Flora L. Santos flsantos@pnri.dost.gov.ph	Financing	215,000.00

DOST/Philippine Council for Advanced Science and Technology Research and Development (PCASTRD)	National Biotechnology Week-Logo Design Contest	Chitho P. Feliciano cpfeliciano@pnri.dost.gov.ph	Financing	233,100.00
DOST/Technology Application and Promotion Institute (TAPI)	Production of Graphic Display Panels on the Applications on Nuclear Science and Technology	Rhodora R. Leonin rleonin@pnri.dost.gov.ph	Financing	60,000.00
Total Local Grants: Php 46,927,898.17				

B. FOREIGN GRANTS

B-1. COOPERATION AGREEMENT

Comprehensive Nuclear Test Ban Treaty Organization (CTBTO)	Post Certification Activities at RNS2, Tanay, Rizal, Philippines	Teofilo Y. Garcia tygarcia@pnri.dost.gov.ph	Financing	Php2,223,028.15
International Atomic Energy Agency (IAEA)	PSP Toxicity Risk Assessment Accumulation and Elimination of Saxitoxin in Green bay Mussels Using Nuclear Techniques	Elvira Z. Sombrito ezsombrito@pnri.dost.gov.ph	Financing	350,957.00
IAEA	Gamma Labelled Toxin for Receptor Binding Assay of Saxitoxin	Elvira Z. Sombrito ezsombrito@pnri.dost.gov.ph	Financing	199,851.00
IAEA	Commission Work for Naturally Occurring Radioactive Material	Teofilo Y. Garcia tygarcia@pnri.dost.gov.ph		106,095.00
United States- Department of Energy (US-DOE)	Megaports Initiative Project – Radiation Detection System Maintenance at the Port of Manila	Julietta E. Seguis jeseguis@pnri.dost.gov.ph		1,037,363.00
US-DOE	Project Management and Oversight Support Global Threat Reduction Initiative (GTR)	Julietta E. Seguis jeseguis@pnri.dost.gov.ph	Financing	1,190,859.79
Comprehensive Nuclear Test Ban Treaty Organization (CTBTO)	Post Certification Activities at RNS2, Tanay, Rizal, Philippines	Teofilo Y. Garcia tygarcia@pnri.dost.gov.ph	Financing	2,223,028.15
International Atomic Energy Agency (IAEA)	PSP Toxicity Risk Assessment Accumulation and Elimination of Saxitoxin in Green bay Mussels	Elvira Z. Sombrito ezsombrito@pnri.dost.gov.ph	Financing	350,957.00
Total Foreign Grants: Php 7,682,139.09				

B-2. IAEA TECHNICAL COOPERATION PROJECTS

IAEA	See Table 5 for List of IAEA Technical Cooperation Projects, Page 36	Equipment Grant, expert dispatch, fellowship/training		Php 40,518,269.40
TOTAL TC Value: Php 40,518,269.40				

B.3 IAEA RESEARCH CONTRACTS

IAEA	See Table 4 for List of IAEA Research Contracts, Page 36	Information exchange thru attendance to meetings; (minimal) financial support towards local expenses/ activities		Php 2,288,600.00
TOTAL RC Value: Php 2,288,600.00				

TABLE 14. LIST OF SCIENTIFIC PUBLICATIONS

TITLE OF SCIENTIFIC PAPER	NAME/E-MAIL OF AUTHORS	PUBLICATION/ NAME/TYPER OF JOURNAL*	DATE PUBLISHED
'UPLB White' and 'Eternity': Two New Varieties of Anthurium For Cutflowers	T.L. Rosario and Fernando B. Aurigue fbaurigue@pnri.dost.gov.ph	The Philippine Agricultural Scientist, 92(4)	2009
'UPLB White' and 'Eternity': Two New Varieties of Anthurium For Cutflowers	T.L. Rosario and Fernando B. Aurigue fbaurigue@pnri.dost.gov.ph	AGGIE Green and Gold. Official Quarterly Publication of the UPLB College of Agriculture Volume X, No. III (July –September 2009) pp.9,15-16.	2009
Sediment Accumulation Rates in Manila Bay, A Marine Pollution Hot Spot in the Seas of East Asia	Efren J. Sta. Maria (ejsmaria@pnri.dost.gov.ph) F. P Siringan, Elvira Z. Sombrito (ezsombrito@pnri.dost.gov.ph), Adelina DM. Bulos (admbulos@pnri.dost.gov.ph)	Marine Pollution Bulletin , v 59, pp. 164-174	2009

Radiation Degradation Studies of Carrageenans	Lucille V. Abad (lvabad@pnri.dost.gov.ph) H. Kudo, S. Saiki, N. Nagasawa, M. Tamada, Y. Katsumura, Charito T. Aranilla (ctaranilla@pnri.dost.gov.ph), Lorna Sta. Ana Relleve (lstanana@pnri.dost.gov.ph), Alumanda M. Dela Rosa (amdelarosa@pnri.dost.gov.ph)	Carbohydrate Polymers 78 (2009) 100-106	2009
Pagpapabuti ng halaman gamit ang 'radiation technology'	Fernando B. Aurigue (fbaurigue@pnri.dost.gov.ph)	PCARRD Farmnews Vol. XXXIV, No. 3, July - September 2009	2009
DOST-PCARRD boosts varietal improvement of selected ornamental plants	Fernando B. Aurigue (fbaurigue@pnri.dost.gov.ph)	The PCARRD Monitor Vol. 37, No. 1 January - March 2009	2009

TABLE 15. TECHNICAL PAPERS/POSTERS PRESENTED

Aranilla, Charito T., A. Bayquen, N. Nagasawa, Lorna Jean H. Relleve, Lucille V. Abad, M. Tamada, and Alumanda M. Dela Rosa. "Carboxymethyl-k-carrageenan Hydrogels Crosslinked by Gamma Radiation for Various Potential Applications". Presented during the 24th Philippine Chemistry Congress, held in Bohol Tropics, Tagbilaran City, Bohol, Philippines, 14-16 April 2009.	Resilva, Sotero S. and Glenda B. Obra. "Improvement of Mass Rearing Methods for Philippine Fruitfly, <i>Bactrocera philippinensis</i> ". Paper presented at the Final Research Coordination Meeting of the Co-ordinated Research Program, Pereybere, Mauritius, 18 -25 September 2009.	
Aranilla, Charito T. and Alumanda M. Dela Rosa. "Review of Status of the Activities on Application of Electron Accelerator- Radiation Processing of Natural Polymers in the Philippines". Presented during the FNCA 10th Coordinator's Meeting, Tokyo, Japan, 11-13 March 2009.	Resilva, Sotero S. Glenda B. Obra and C.L. Chang. "The Suitability of Liquid Diet in Rearing Philippine Fruitfly, <i>Bactrocera philippinensis</i> (Diptera: Tephritidae)". Paper presented at the Research Coordination Meeting of the Co-ordinated Research Program, Pereybere, Mauritius, 18 -25 September 2009.	
Aurigue, Fernando B. "Selection of Philippine Aroids for the Ornamental Industry". Presented during the Flora Filipina Conference at the Bureau of Soils and Water Management Conference Hall, Diliman, Quezon City, Philippines, 7 February 2009.	Sombrito, Elvira Z. et al. "Development of a Toxicity Model for PSP Toxins in Mussel". Presented during the First National Summit on the Culture and Processing of Shellfishes, Dagupan City, Pangasinan, Philippines, 22-24 September 2009.	
Bernido, Corazon C. "Global Status of Nuclear Power and the Needed Human Resources". Paper presented at the 3rd Engineering Research and Development Technology (ERDT) Conference, Manila, 11 September 2009. Published in the Proceedings of the ERDT Conference.	Sombrito, Elvira Z. "Nuclear Techniques in Climate Change". Presented during the Quezon City Science Community - National Science and Technology Week (QCSSC-NSTW) 2009 Research Symposia on Climate Change, Ayala Techno Hub, Quezon City, Philippines, July 2009.	
Bulos, Adelina DM. "Assessment of Soil Erosion Using Fall-Out Radionuclides in the Inabanga Watershed in the Philippines". Presented during the Final Meeting RAS 043 in Beijing, China, January 2009.	Sombrito, Elvira Z. and E.A. Gonzales. "Promoting Interdisciplinary Research: Integrated Environmental Monitoring Program of Manila Bay". Presented during the EAST ASIAN Congress at the Philippine International Convention Center, Roxas Blvd, Manila, Philippines, November 2009.	
Cansino, Percedita T. "Present Status of Philippine National Policy and Program on Nuclear Power". Presented during the FNCA 2009 Workshop on Human Resources Development Program held in Tsuruga, Japan on 22 -25 June 2009.	Sombrito, Elvira Z. and J.S. Lee. "Promoting Applications of Nuclear Techniques in Climate Change". Presented during the EAST ASIAN Congress at the Philippine International Convention Center, Roxas Blvd, Manila, Philippines, November 2009.	
De Leon, A. and Elvira Z. Sombrito. "Development of a Toxicity Model for Paralytic Shellfish Toxins in Mussel: Uptake and Release of Toxins in Green Bay Mussel". Presented during the 24th Philippine Chemistry Congress, Bohol Tropics, Tagbilaran City, Bohol, Philippines, 14-16 April 2009.	Sombrito, Elvira Z. "Harmonizing Nuclear and Isotopic Techniques for Marine Pollution Management at the Regional Level". Country Report presented during the Planning Meeting of RAS 7/019, Malaysia, 22-26 June 2009.	
Graña, Alfonso O., Faye G. Rivera, Adelaida C. Barrida, Ana Marie S. Veluz and Mary Jayne C. Manrique. "Field Screening and Evaluation of High Yielding Mungbean Genotypes for Drought Tolerance and High Protein Content". Paper presented at the Mid-term Progress Review Meeting of IAEA/RCA Project RAS/5/045 on "Improvement of Crop Quality and Stress Tolerance for Sustainable Crop Production Using Mutation Techniques and Biotechnology" held at Kimdo Hotel, Ho Chi Minh City, Vietnam, 16-20 February 2009.	TECHNICAL POSTERS	
Graña, Alfonso O., Avelina G. Lapade, Adelaida C. Barrida and Faye G. Rivera. "Grain Quality Improvement in Rice (<i>Oryza sativa</i> L.) Through Induced Mutation Breeding". Paper presented at the FNCA Mutation Breeding Workshop, Hangzhou, China from 21 -24 September 2009.	Castañeda, Soledad S., Raymond J. Sugcang, Rosalina Almoneda and Norman S. Mendoza. "Ion Ratios and Tritium Extents as Markers of Salinization in the Bacolod City Basin". Technical poster presented during the 24th Philippine Chemistry Congress and the Asia-Pacific Conference on Chemistry Education, Tagbilaran, Bohol, 14 -16 April 2009.	
Lapade, Avelina G., Mary Jayne C. Manrique, Ana Marie S. Veluz, Adelaida C. Barrida, Fernando B. Aurigue and Alfonso O. Graña. "Crop Improvement Through Mutation Breeding". Paper presented during the 5th National Biotechnology Week Scientific Forum held at the Event Room, Nido Fortified Science Discovery Center, Mall of Asia, Pasig City, Philippines, 24 November 2009.	Mendoza, Norman S., Raymond J. Sugcang, Soledad S. Castañeda. "Establishment of Tritium Dating Facility for Hydrological Studies in PNRI". Technical poster presented during the 24th Philippine Chemistry Congress and the Asia-Pacific Conference on Chemistry Education, Tagbilaran, Bohol, 14 -16 April 2009.	
Obra, Glenda B. and Sotero S. Resilva. "Improvement of Sterile Male Performance of <i>Bactrocera philippinensis</i> ". Paper presented during the Final Research Coordination Meeting of the Co-ordinated Research Program, Mauritius on 18 -25 September 2009.	LIST OF ABBREVIATIONS	
Olivares, Ryan U., Hakuta, K. and S. Tabeta. "Simulations of Currents, Temperature and Salinity in Manila Bay by a Hydrodynamic Model". Paper presented during the International Offshore and Polar Engineering Conference (SOPE), Osaka, Japan, 21-26 June 2009.	ANSTO Australian Nuclear Science and Technology Organization	KWSE Korean Women Scientists and Engineers
Rivera, Faye G., Alfonso O. Graña, Avelina G. Lapade, Adelaida C. Barrida, Ana Marie S. Veluz and Mary Jayne C. Manrique. "Research Development in Grain Quality Improvement and Breeding for Increase Protein and Other Nutrient Composition of Some Food Crops Using Mutation Techniques at the PNRI". Paper presented at the Mid-term Progress Review Meeting of IAEA/RCA Project RAS/5/045 on "Improvement of Crop Quality and Stress Tolerance for Sustainable Crop Production Using Mutation Techniques and Biotechnology". Kimdo Hotel, Ho Chi Minh City, Vietnam, 16 -20 February 2009.	ANSN Asian Nuclear Safety Network	MEXT Ministry of Education, Culture and Sports of Japan
Rañada, Ma. Llorina and Elvira Z. Sombrito. "Comparisons of Receptor Binding Assay with Mouse Bioassay as Screening Method for Shellfish Toxicity". Paper presented during the 24th Philippine Chemistry Congress, Bohol Tropics, Tagbilaran City, Bohol, Philippines, 14-16 April 2009.	CTBTO Comprehensive Nuclear Test Ban Treaty Organization	NNSA National Nuclear Security Administration of Japan
	DOST Department of Science and Technology	NSRA Nuclear Safety Research Association of Japan
	FNCA Forum for Nuclear Cooperation in Asia	NSSG Nuclear Safety and Security Group
	IAEA International Atomic Energy Agency	PHIVOLCS Philippine Institute of Volcanology and Seismology
	ICTP International Center for Theoretical Physics, Italy	RCA Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific
	IMO International maritime Organization	
	IAEA Japan Atomic Energy Agency	RCARO RCA Regional Office in Korea
	JSPS Japan Society for the Promotion of Science	SEI Science Education Institute
	KAERI Korea Atomic Energy Research Institute	USDOE United States Department of Energy



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* Until May 15, 2009

** May 16 to December 31, 2009



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Elvira Z. Sombrito



Flora L. Santos, MSc

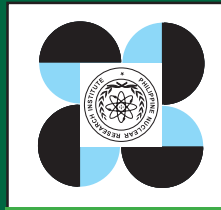


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