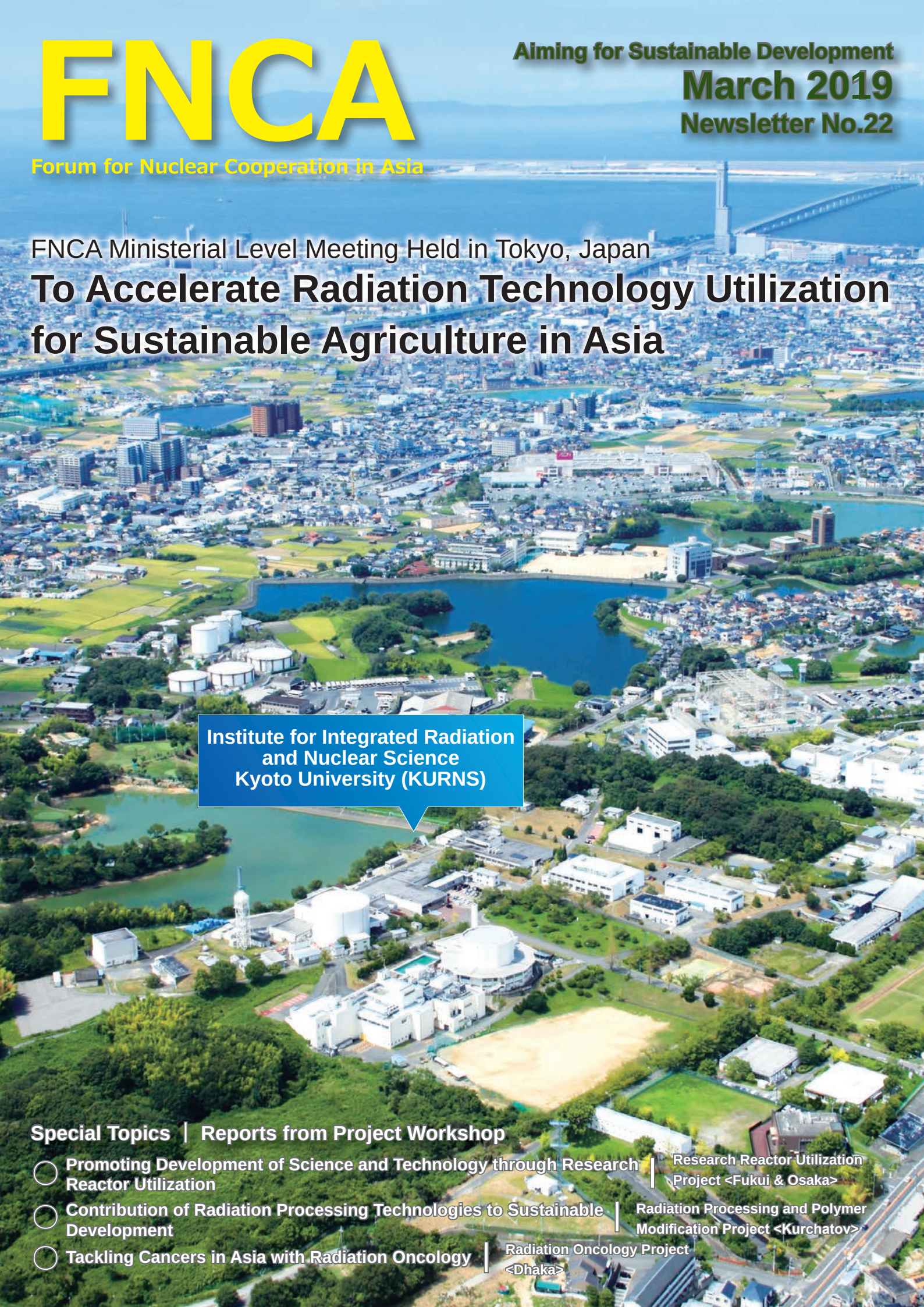
FNCA

Forum for Nuclear Cooperation in Asia

Aiming for Sustainable Development
March 2019
Newsletter No.22

FNCA Ministerial Level Meeting Held in Tokyo, Japan

To Accelerate Radiation Technology Utilization for Sustainable Agriculture in Asia



Special Topics | Reports from Project Workshop

- Promoting Development of Science and Technology through Research Reactor Utilization | Research Reactor Utilization Project <Fukui & Osaka>
- Contribution of Radiation Processing Technologies to Sustainable Development | Radiation Processing and Polymer Modification Project <Kurchatov>
- Tackling Cancers in Asia with Radiation Oncology | Radiation Oncology Project <Dhaka>

From left to right: Mr Fumikazu Sato, Cabinet Office (CAO)/Dr Lucille V Abad, Philippine Nuclear Research Institute (PNRI)/Ms Kanchalika Dechates, Thailand Institute of Nuclear Technology (TINT)/Dr Tran Ngoc Toan, Vietnam Atomic Energy Institute (VINATOM)/Mr Toshio Sano, Japan Atomic Energy Commission (JAEC)/Dr Tomoko M Nakanishi, JAEC/Dr Pornthep Nisamaneephong, TINT/Mr Tomoaki Wada, FNCA Coordinator of Japan/Mr Manlaijav Gunaajav, Nuclear Energy Commission of Mongolia/Mr Takuya Hirai, Minister of State for Science and Technology Policy, Japan/Dr Yoshiaki Oka, JAEC/Dr Qu Liang, International Atomic Energy Agency (IAEA)/ Dr Renato U. Solidum, Jr., PNRI/Ms Lynn Tan, Australian Nuclear Science and Technology Organisation (ANSTO)/Dr Geordie Graetz, ANSTO/Prof Dr Md. Sanowar Hossain, Bangladesh Atomic Energy Commission (BAEC)/Prof Erlan Batyrbekov, National Nuclear Center (NNC) of the Republic of Kazakhstan/Mr Yevgeniy Tur, NNC/Prof Long Maoxiong, China Nuclear Energy Association (CNEA)/Dr Mahbubul Hoq, BAEC/Dr Muhammad Dimyati, Ministry of Research, Technology and Higher Education (RISTEKDIKTI)/Mr Falconi Margono Soetarto, National Nuclear Energy Agency of Indonesia (BATAN)/Mr Zhang Gangqiang, China Atomic Energy Authority (CAEA)

◎ To Contribute to Asian Agriculture Development by Radiation Technology Utilization

FNCA Ministerial Level Meeting
Held in Tokyo, Japan

The 19th FNCA Ministerial Level Meeting was held at Mita Conference Hall, Tokyo, Japan on December 6, 2018. The meeting was organized by the Cabinet Office of Japan and the Japan Atomic Energy Commission.

Ministers and other leaders in charge of the field of nuclear science and technology from FNCA member countries held policy discussions under the theme “Contribution to Asian Agriculture by Radiation Technology Utilization”.

From Japan, Mr Takuya Hirai, Minister of State for Science and Technology Policy, attended the meeting on behalf of the government of Japan, and expressed his expectation that nuclear science technologies would be shared through the activities of FNCA, which will bring benefits to a wide range of economic society.

The meeting concluded with the adoption of a joint communique referring to the "Themes and activities to be promoted", “Effort to enhance the practical use of R&D results" and so on.

■ Keynote Speech

Mr Qu Liang, Director of Joint FAO/IAEA Division in Food and Agriculture, IAEA for the Joint-FAO/IAEA Program, gave a keynote speech under the title of "Nuclear Applications Contributing to Food and Agriculture in Asia", in which he introduced the outlines of FAO /IAEA organizations and their activities, and applications and results of nuclear science technologies to food and agriculture in Asia.

■ Country Report

Representatives of each country reported the progress of nuclear energy policies and initiatives including information regarding "Applications of radiation technologies to agriculture." During this report, the Japanese representative described the outline of the energy basic plan, which was approved in a Cabinet meeting in July 2018, and introduced the progress of the decommissioning work at TEPCO's Fukushima Daiichi Nuclear Power Station after the accident, and the state of the reconstruction of surrounding areas by using a video.

For detailed results of the Ministerial Meeting, refer to http://www.aec.go.jp/jicst/NC/sitemap/fnca_e.htm

■ Round Table Discussion

With the main theme "Contribution to Asian Agriculture by Radiation Technology Utilization" divided into three sub-themes "Sustainable Agriculture," "Food Security," and "Climate Change and Agriculture," representatives from the Philippines, Malaysia, and Australia introduced case studies in their own countries for each sub-theme respectively, and the exchange of opinions took place based on them. Dr Tomoko M Nakanishi, the chairperson, summarized the meeting by saying that radiation technologies were an effective and essential means of shifting from conventional agriculture that pursued land and labor productivity to sustainable agriculture that secures not only quantity but also quality (such as food security and environmental conservation), and the participants shared the necessity of the further vitalization of research activities and the promotion of commercialization of research outcomes.

■ The 2nd FNCA Award Ceremony

The 2nd FNCA Award Ceremony took place. It praised the country that attained an outstanding achievement among the FNCA project activities in 2017. (See Page 15 for the FNCA Award)

■ Joint Communique

As a summary of the meeting, Joint Communique was adopted as follows to describe the course of action.

- Furthering the activities related to the application of nuclear science and technology particularly in such areas as agriculture development and food security, environment protection, and human health, as well as human resource development for nuclear safety and security culture by adopting possible future R&D themes in order to support sustainable development of the member countries.
- Encouraging the member countries to bring the R&D products of such projects as mutation breeding and radiation processing and polymer modification into the commercialization for the member country’s socio-economic well-being through expansion of crop yields.
- Encouraging member countries to reinforce the promotion of radiation oncology in transition from experimental phase to practicing phase, with dissemination of the published protocols and hands-on training through the cooperation during the workshops.
- Continuing to promote cooperation with relevant international organizations including the IAEA and OECD/NEA.
- Increasing sponsorship of each member country to new projects to be adopted in whole or in part, so as to allow the adoption of more projects covering the various interests of member countries.

Mr Takuya Hirai

Minister of State for Science and Technology Policy, Japan

Decommissioning Making Good Progress
Mutation Breeding Technology Contributing to Tsunami Damaged Region

In July 2018, the Japanese Cabinet approved the country's Fifth Basic Energy Plan, which set forth targets for Japan's energy mix through 2030. The plan maintains nuclear energy as a baseload (low carbon and quasi-domestic) power source for producing 20–22% of the country's electricity generation.

Nuclear power can provide a stable and secure energy supply at a relatively inexpensive price while responding to the global warming crisis. The government therefore aims to restart existing Light Water Reactors (LWR) and to operate them as long as possible. To date, nine LWRs have already been restarted, six are currently conducting safety measures, and 12 are having their safety measures validated.

The Japanese Government is calling for a nuclear fuel cycle maintenance strategy and is planning to both reprocess spent fuel and effectively recycle plutonium. Currently, a plan is underway to use plutonium in existing LWRs through the use of the Rokkasho Reprocessing Plant and the MOXT fuel plant, both of which are still under construction.

Decommissioning of the Fukushima Daiichi NPP is being conducted as planned. The radiation dose has decreased considerably, except in certain areas, and the decommissioning environment has improved remarkably. Reconstruction in the evacuation zone is progressing, and the government is committed to recovery efforts.

Based on 2015 survey data, the economic scale of Japan's radiation application is 4.37 trillion yen, with industrial applications accounting for 51%, followed by medical applications at 44%, and agricultural applications, which were the lowest, at 5%. Within the agricultural realm, mutation breeding accounted for more than 90%, of which 88% was for rice breeding.

Japan is engaged in mutation breeding that is induced by a heavy ion beam, which causes double-strand breaks in plant cells' DNA and changes their genetic information, leading to changes in the expression and characteristics of the plant. At present, 30 mutants and two microbes have been developed using the radioactive isotope beam factory at RIKEN. This technology is being applied to research on salt-tolerant mutant rice that can grow in the salt-injured paddy field of the Miyagi prefecture, which was damaged by a tsunami in 2011.

Dr Renato U. Solidum, Jr

Undersecretary, Department of Science and Technology

Commercialization of Agricultural Products Started
Expecting to Start Producing Tc-99m in 2019

The Philippine Nuclear Research Institute (PNRI) has been continuously working towards re-establishing its research reactor as a subcritical assembly expected to be commissioned by December 2020. Meanwhile, test runs are being conducted with the Tc-99m Generator production facility. It is expected to produce Tc-99m for market distribution on a weekly basis starting 2019.

The general policy in the Philippines for the management of hazardous wastes is now being updated thru the House Bills on a) "Hazardous and Radioactive Wastes Management Act" and b) "An Act Providing for a Comprehensive Nuclear Regulatory Framework" for spent fuel management. New regulations relevant to radioactive waste management have also been developed and are now for review and publication. Moreover, the PNRI operates the pre-disposal facility for the management and interim storage of radioactive wastes which are generated from industrial and medical uses.

The Carrageenan Plant Growth Promoter (PGP), processed by e-beam technology, has been tested in over 15,000 hectares of rice field in different regions of the Philippines. It has been proven to be effective, increasing the yield by 20 – 30%. Currently, two technology adopters have signed the licensing agreement with PNRI. It is expected to start commercialization at the end of 2018.

Dr Muhammad Dimyati

Director of General of Strengthening for Research and Development, Ministry of Research, Technology and Higher Education

A Number of Mutants Developed in Agricultural Field
Planning to Establish Environmental Laboratory

Annual public opinion surveys at the end 2016 showed that the public acceptance level has tended to increase during the last five years, with the highest acceptance level measured, 77.53%. This number shows Indonesian citizens' confidence in the importance of nuclear energy as part of the national energy mix to meet electrical power demand.

In the area of food and agriculture, Indonesia has successfully improved the quality of local rice by using a plant mutation breeding technique. Currently, 23 mutant rice varieties have been officially released by the Ministry of Agriculture of Indonesia, with an average productivity of seven tons per hectare, higher than the national average of five tons per hectare. Another products of mutation breeding techniques yielded 10 soybean varieties, 2 green bean varieties, 3 sorghum varieties, 1 tropical wheat variety, 1 peanut variety and 1 cotton variety.

In the area of environment, the government of Indonesia in cooperation with the IAEA has been applying nuclear techniques for addressing the air pollution issues and studying the impact of ocean acidification on marine environment. Indonesia is planning to establish a marine radioecology laboratory in the north of Java Island.

Promoting Development of Science and Technology through Research Reactor Utilization

Research Reactor Utilization Project Workshop Held in Fukui and Osaka

Venue : Fukui and Osaka, Japan
Held on : October 22 through 25, 2018
Hosted by : Ministry of Education, Culture, Sports, Science and Technology (MEXT)
Participating Countries : Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Republic of Korea, Malaysia, Mongolia, the Philippines, Thailand and Vietnam (12 countries)

The workshop on Research Reactor Utilization was held for 4 days on October 22 through 25, 2018 in Fukui and Osaka, Japan. On the first day, “Open Seminar on FNCA Research Reactor Utilization” was held in the Wakasa Wan Energy Research Center, and attended by about 100 people. In the seminar, Dr Taro Ide, MEXT, gave opening remarks and keynote speech on “Current Status of Japanese Nuclear Energy Research and Development Policy and Programs”. In the workshop held on the second onward, participants from member countries made presentations on various topics related to utilizing research reactors (including neutron activation analysis, boron-neutron capture therapy (BNCT), neutron radiography (NR), material studies and radioisotope (RI)production) as well as held discussions. In addition, technical visits were made to Kyoto University Research Reactor (KUR), a hot laboratory and the Particle Radiation Oncology Research Center of Institute for Integrated Radiation and Nuclear Science, Kyoto University (KURNS).

Group Photo of the Participants
The ninth from the left is Prof Otsuki, and the eleventh from the left is Prof Ebihara, both of whom are the project leaders of Japan

Promoting Cooperation among Researchers Regarding Multipurpose Utilization of Research Reactors

■ **FNCA Open Seminar on Research Reactor Utilization**
FNCA Open Seminar on Research Reactor Utilization was held in the Wakasa Wan Energy Research Center (Fukui, Japan) on 22nd October, attended by about 100 participants. The seminar started with the opening remarks by Dr Taro Ide, MEXT, and Mr Mitsuyuki Tatsuta, Fukui Prefectural Government. From Japan, keynote speeches titled “Current Status of Japanese Nuclear Energy Research and Development Policy and Programs” and “Utilization of Research Reactor in KURNS” were made respectively by Dr Ide, MEXT, and Prof Tsutomu Otsuki, Kyoto University. Mr Tomoaki Wada, FNCA Coordinator of Japan, reported the “Overview and progress of FNCA”. Following the keynote speeches, three FNCA member countries gave presentations titled “NAA in Australia - national and international partnerships“, “Utilization of Research Reactor in Indonesia “ and “Utilization of the Dalat Research Reactor in Vietnam “ respectively to share the information on their current engagements.

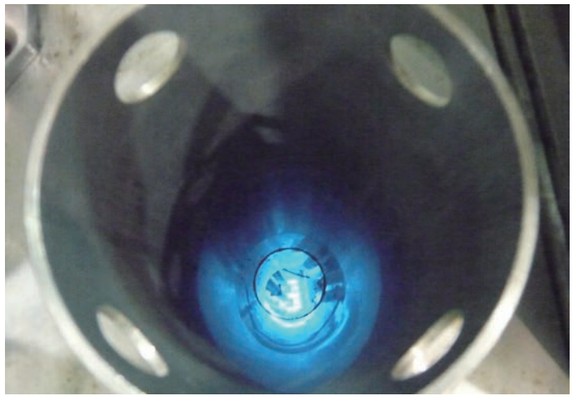
■ **Boron-neutron Capture Therapy (BNCT)**
Boron-neutron capture therapy (BNCT) is a unique radiotherapy in particle radiation oncology. In this therapy, a boron agent is administered to patients with cancer in advance. The cancer-affected parts are irradiated with neutron beams, which kill the cancer cells by utilizing α particles and Li ions generated by boron-neutron nuclear reaction. At the KURNS, more than 500 patients have been treated by BNCT with the aid of the KUR. The effectiveness of BNCT has been demonstrated in the treatment of not only malignant melanoma and brain tumors but also head and neck tumor, malignant mesothelioma and liver cancer. The current situation of BNCT using KUR and a cyclotron neutron source was demonstrated in this workshop.

■ **Neutron Radiography (NR)**
Neutron radiography (NR) is a nondestructive visualization technique focusing on the damping characteristic brought about by the interaction (capturing, scattering and nuclear reaction) that occurs between nuclei and neutrons when neutrons pass through matter. Participants from member countries reported interesting research activities: research on nondestructive imaging for archaeological samples, such as ancient jar and sculpture of Buddha; imaging techniques for research on the dynamic behavior of fuel cell and nuclear materials; fluid dynamics observed in motor engines and the boiling phenomenon.

Open Seminar at the Wakasa Wan Energy Research Center

Technical Visit to the particle radiation oncology research center

Technical Visit to Kyoto University Research Reactor (KUR)



Cherenkov radiation of the KUR core

Clockwise from the upper left: Plant growth promoter spray test to pepper (Indonesia), oligochitosan application test on catfish (Vietnam), planting of pine trees by using super water absorbant in arid area (Kazakhstan), biofertilizer application test on wheat (China)

Contribution of Radiation Processing Technologies to Sustainable Development

Radiation Processing & Polymer Modification Project Workshop Held in Kazakhstan

Venue : Kurchatov, Kazakhstan
Held on : October 8 through 12, 2018
Hosted by : Ministry of Education, Culture, Sports, Science and Technology (MEXT)
National Nuclear Centre of the Republic of Kazakhstan (NNC)
Participating Countries : Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, the Philippines, Thailand and Vietnam (10 countries)

The workshop of this project was held for 5 days on October 8 through 12, 2018 in Kurchatov city, Kazakhstan. The project newly launched this year by merging the former Electron Accelerator Application Project and the former Biofertilizer Project started its activities as Radiation Processing and Polymer Modification Project.
On the first day, an Open Seminar titled “Prospect of Radiation Processing and Polymer Modification” was held in NNC and attended by about 80 people. On the fourth day, a technical visit was conducted, and the participants took a tour of Tokamak facility, Laboratories of Institute of Radiation Safety and Ecology, JSC “Park of Nuclear Technologies”, Semipalatinsk test site, which was a nuclear experimental field for the Soviet Union, and its museum.

Semipalatinsk Test Site
The sixth from the right is Dr Tamada, the project leader of Japan

Applying Radiation Technologies to Various Fields of Agriculture, Medicine and Environment, Aiming for Sustainable Development in Asian Region

■ Results in each country reported at the workshop

Experts in the radiation processing field reported the research findings on animal feed, environmental remediation, and medical applications as well as plant growth promoters (PGP) and super water absorbents (SWA) to agriculture applications in the former project. In China, amidoxime fibrous adsorbent is being developed by using the grafting technology to extract uranium from seawater. In Indonesia, they succeeded in decreasing cholesterol and neutral fat in the blood and increasing the weight of eggs by giving oligochitosan to local ducks. In the Philippines, it was reported that paddies treated with carrageenan PGP survived (lower left photo) though many paddy fields were damaged by the major typhoon Mangkhut in September 2018.
Experts in the biofertilizer field reported on the synergetic effects of biofertilizers and PGPs, breeding of microbes by using radiation, and sterilization of microbial inoculation carriers. It was reported that carriers sterilized by gamma radiation realized longer life-span of inoculation microbes than autoclave sterilization (high-pressure steam sterilization). In addition, in the Philippines, carriers whose storage life has become longer through gamma rays radiation were put into practical use.

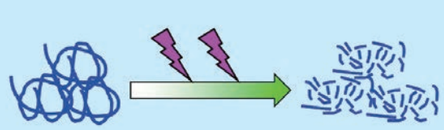
▲ Paddy field after the big typhoon Mangkhut in September 2018 (Philippine Nuclear Research Institute)

▲ Paddy processed with carrageenan PGP (right) and control (left)

■ Radiation Processing and Polymer Modification Project

This project produces versatile materials with useful functions by modifying natural polymers such as shrimp shells, crab shells, cassava, or seaweed, which are available inexpensively in Asian countries, through degradation, crosslinking and grafting by means of electron beam or gamma ray irradiation.

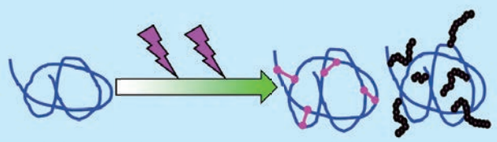
Degradation
Electron Beam/Gamma Ray



Chitosan (Shrimp/Crab shell)
Carrageenan (Seaweed)

PGP

Crosslinking & Grafting
Electron Beam/Gamma Ray



Starch (Cassava)
Carrageenan (Seaweed)

Crosslinking Grafting

SWA

Use of radiation is a highly efficient way of producing oligomers (oligosaccharides) used as Plant Growth Promoters. Using radiation can produce environmentally friendly and nontoxic PGPs. It is expected that the foliar spraying of PGPs onto agricultural crops will increase yield, improve taste, and improve disease endurance, etc. Oligomers are also used as supplement for additive of livestock feeds.

Only radiation can modify natural polymers into Super Water Absorbent. Mixing SWA with dry soil in arid area increases its water retention, contributing to the improvement of irrigation frequency and the increase of crop yields. In recent years, studies are also in progress on its application as wound dressing, adsorbents for toxic metals, and dosimeter/indicator for verifying irradiated region in cancer therapy.

Tackling Cancers in Asia with Radiation Oncology
Radiation Oncology Project Workshop Held in Bangladesh

Venue : Dhaka, Bangladesh
Held on : November 4 through 7, 2018
Hosted by : Ministry of Education, Culture, Sports, Science and Technology (MEXT)
Bangladesh Atomic Energy Commission (BAEC), Oncology Club
Participating Countries : Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, the Philippines, Thailand and Vietnam (10 countries)

The workshop on Radiation Oncology Project was held for 4 days on November 4 through 7, 2018 in Dhaka, Bangaldesh. On the first day, Honorable Minister Mr Yeafesh Osman, Ministry of Science and Technology, Bangladesh delivered welcome remarks.
On the first and second days, treatment results of a total of five ongoing clinical trials in the project for cervical, nasopharyngeal, and breast cancers were reported from each member state. In addition, Japan gave presentations on the progress of dosimetry audits that they are carrying out to perform better radiotherapies and the future schedule of such audits that they will carry out for the same purpose.
On the third day, participants visited Delta Hospital Ltd. and United Hospital Ltd. in Dhaka City to inspect the sites of clinical trials of this project. Moreover, as an initial trial of the project, hands-on training on the fifth clinical trial for cervical cancer, namely, "Cervix-V," was conducted by the Japanese radiation oncologists and medical physicists at United Hospital in parallel with the hospital tour.

On the fourth day, Open Lectures were held at the National Institute of Cancer Research and Hospital, on the situations surrounding radiation oncology in Bangladesh and other FNCA member countries as well as on leading-edge radiotherapies including heavy ion radiotherapy.

Participants in the workshop who visited United Hospital
The visit and hands-on training were reported in the local media.
The eighth from the left in the front raw is Prof Kato, the project leader of Japan

Endeavors to Disseminate Leading-Edge Radiotherapy for Cervical Cancer, Which Has a High Level of Incidence in Asia

■ Start of 3D-IGBT

To date, this project has established four protocols (treatment procedures) for cervical cancer. In 2018, the fifth clinical trial, Cervix-V, was launched, in which 3D-Image guided brachytherapy (3D-IGBT), which is leading-edge radiotherapy, used. 3D-IGBT is a cutting-edge radiotherapy for uterine cervical cancer which can accurately deliver radiation to the tumor. In 3D-IGBT, CT or MRI images are taken with applicators in place. These images provide accurate information on the topographic relationship between applicators, the cervical tumor, and surrounding normal tissues. Treatment planning using CT or MRI images enables to deliver high radiation dose to the tumor with minimizing doses to the normal tissues. There have been many reports that describe favorable treatment outcomes and low incidence of radiation complications. Accordingly, better treatment outcomes can be expected.

■ Hands on Training of 3D-IGBT

In connection with the start of Cervix-V using 3D-IGBT, many FNCA member states wanted technical guidance on 3D-IGBT because it requires a high level of skill. In response to this demand, hands-on training on 3D-IGBT was conducted in this workshop as an initial trial by the project. Under the guidance of Japanese, Thai, and Bangladeshi radiation oncologists and medical physicists, a number of Radiation Oncologists and Medical Physicists from local hospitals learned the protocol and skills.
Therapeutic institutions in the FNCA member states have various problems including a lack of human resources and facilities, and many of them are yet to develop an adequate environment for implementing 3D-IGBT. It is expected that hands-on training will serve as a medium through which guidance providers ascertain on-site problems and give guidance on therapies while taking on-site environments into consideration, so that guidance recipients can perform treatment without fail and then obtain highly reliable clinical treatment results.
Hands-on training on 3D-IGBT is scheduled to take place at a future workshop in FNCA member countries as well, expected to contribute to the dissemination of 3D-IGBT across the Asian region as well as to upgrading radiation oncology as a whole.

Briefing on 3D-IGBT

Applicator insertion

Training on actual treatment planning

Discussions of various matters including 3D-IGBT and intracavitary irradiation

Introduction of On-going 7 Projects

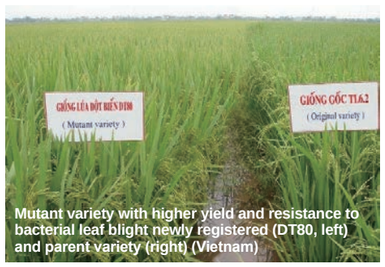
As FNCA Project activities, 7 projects are being conducted in various fields. Each project promotes joint research, debates in common challenges, and holds a workshop annually. Each project also reports reach results and provides guidelines / manuals on which research in Asian countries should be based.

▼Mutation Breeding

This project has been using mutation breeding technology with irradiation to major crops and establishing new varieties with higher yield under low-input condition and more resistance to various environmental stress under climate change in order to promote sustainable agriculture.

■ Workshop 2018

- Dates: October 29-November 1
- Place: Hanoi, Vietnam
- Participating Countries: 9



Mutant variety with higher yield and resistance to bacterial leaf blight newly registered (DT80, left) and parent variety (right) (Vietnam)

■ TOPICS

- Indonesia delivered follow-up report for the result of terminated sub-project on sorghum and soybean.
- Progress report and 5-year plan were presented and discussed on “Mutation Breeding of Major Crops for Low-input Sustainable Agriculture under Climate Change” project which was newly started in 2018.
- Current status on cooperation between FNCA and IAEA/RCA was reported and a strategy to promote collaboration was discussed.
- Participants visited Agricultural Genetics Institute and observed laboratories, research facilities, and mutant varieties collection room.

▼Research on Climate Change using Nuclear and Isotopic Techniques

Aiming at interpretation of the mechanisms and processes of past climate change in Asia Pacific region, this project promotes sharing climate archives and the expertise in member countries by using nuclear and isotopic analysis.

■ Workshop 2018

- Dates: September 24-28
- Place: Semarang, Indonesia
- Participating Countries: 10

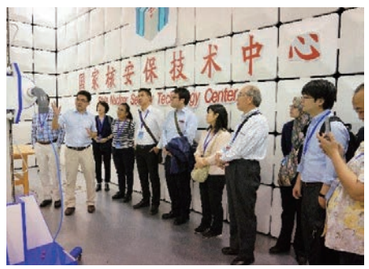

Sampling of sediment coring in the Lake Rawa

■ TOPICS

- Country presentations were delivered on the progress of their analysis and research for the climate archives (lake/river sediments, corals/shells, speleothem, tree ring, etc.) and soil carbon storage
- Workshop participants attended the 8th International Seminar on New Paradigm and Innovation on Natural Science and Application (ISNPINSA 2018) organized by Faculty of Sciences and Mathematics Diponegoro University.
- Sampling demonstration of sediment coring was conducted in the Lake Rawa Pening, which was first sampling since the project launched.

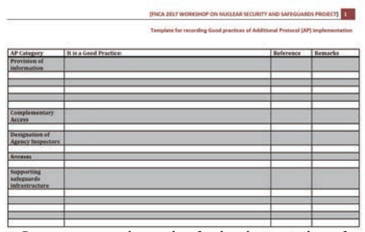
▼Nuclear Security and Safeguards

Promotion of peaceful use of nuclear power requires the improvement and maintenance of nuclear safety, security and safeguards. This project has been enhancing nuclear security and safeguards in Asian countries by sharing information, and cooperation in developing human resources.



■ Workshop 2018

- Dates: September 11-13
- Place: Beijing, China
- Participating Countries: 9


Survey on good practice for implementation of Additional Protocol conducted in 2018 (template)

■ TOPICS

- Information on the implementation of nuclear security and safeguards in each country in 2018 was shared.
- Reports and discussion were made on the nuclear forensics, cyber security, good practice of Additional Protocol implementation and etc. as common major issues in member countries.
- Discussion was made for the future cooperation and training on the capacity building on nuclear forensics.
- Discussions were made on the result of the survey to good practice of Additional Protocol implementation in member country and plan to make a report for its compilation and analysis.

▼Radiation Processing and Polymer Modification for Agricultural, Environmental and Medical Application

This project newly launched this year by merging the former Electron Accelerator Application Project and the former Biofertilizer Project with a new theme on radiation processing and polymer modification.

■ Workshop 2018

- Dates: October 8-12
- Place: Kurchatov, Kazakhstan
- Participating Countries: 10

■ TOPICS

- The Open Seminar titled "Prospect of Radiation Processing and Polymer Modification" was held in the National Nuclear Center and had ca. 80 participants.
- Group discussion was made on Seven research themes, namely "Degraded Chitosan for Animal Feeds", "Hydrogel for Medical Application", "Environmental Remediation", "Synergistic Effect of Plant Growth Promoters (PGP), Super Water Absorbents (SWA) and Biofertilizer (BF)", "PGP and SWA, Inclusive of Process Development", "Mutation Breeding of BF Microbe Using Gamma Irradiation" and "Sterilization of BF Carrier Using Gamma Irradiation".
- Participants visited Tokamak facility, Museum of Semipalatinsk Test Site, Laboratories of Institute of Radiation Safety and Ecology, Semipalatinsk experimental field site, and JSC "Park of Nuclear Technologies".of RDA.

*Please refer to P7-8 for more details about this project.

▼Radiation Oncology

This Project has been establishing optimal treatments and improving treatment results for cancers that are common in Asia, and also disseminating radio therapeutic methods throughout Asia.

■ Workshop 2018

- Dates: November 4-7
- Place: Dhaka, Bangladesh
- Participating Countries: 10

■ TOPICS

- Reports and discussions were delivered on the 5 topics namely 1) Phase II Study of Concurrent Chemoradiotherapy with Extended-Field Radiotherapy for Locally Advanced Cervical Cancer, 2) Prospective Observational Study of 3D-Image Guided Brachy Therapy for Locally Advanced Cervical Cancer, 3) QA/QC for 3D-IGBT, 4) Phase II Study of Neoadjuvant Chemotherapy with Concurrent Chemoradiotherapy for Nasopharyngeal Carcinoma, and 5) Phase II Studies of Hypofractionated Radiotherapy for Breast Cancer.
- Hands-on training in the local hospital was organized in the workshop for the first time. At the training, radiation oncologists and medical physicists from local hospitals studied the treatment method and technology of the 3D-IGBT under the guidance of workshop participants.

*Please refer to P9-10 for more details about this project.

▼Research Reactor Utilization

This project has been promoting mutual collaboration among researchers in Asian countries on multipurpose use of research reactors and aims to contribute to the personnel training of researchers concerned with the research reactors of each Asian country, based on the experience of the research reactor in Japan.

■ Workshop 2018

- Dates: October 22-25
- Place: Fukui & Osaka, Japan
- Participating Countries: 12

■ TOPICS

- FNCA Open Seminar "Research Reactor Utilization" was held in Tsuruga city, co-hosted with Fukui Prefectural Government and the Wakasa wan Energy Research Center.
- In the group of research reactor utilization (RRU), lead speech from Kyoto University and country reports were delivered and discussion was made for boron neutron capture therapy (BNCT), neutron radiography, material research and so on.
- In the group of neutron activation analysis (NAA), country reports were delivered on air pollution and mineral resources. Participants confirmed the capabilities of the NAA as an important analysis method of reference materials.
- Participants visited Institute for Integrated Radiation and Nuclear Science, Kyoto University, including Kyoto University Research Reactor and the particle radiation oncology research center.

*Please refer to P5-6 for more details about this project.

▼Radiation Safety and Radioactive Waste Management

This Project has been improving radiation safety of nuclear / radiation facilities in FNCA countries. In order to assure radiation safety for the public, FNCA countries also share information on appropriate treatment and disposal of radioactive waste management as well as the environmental impact assessment.

■ Workshop 2018

- Dates: October 17-19
- Place: Sydney, Australia
- Participating Countries: 12

■ TOPICS

- Country reports were delivered on the current status of the low-level radioactive waste repository including challenges, problems and future plan.
- At the group discussion for the consolidated report, country reports were made on low-level radioactive waste repository and experiences of the public acceptance for radioactive waste.
- Open seminar was held at Australian Nuclear Science and Technology Organisation (ANSTO) and had ca. 50 participants. Participants also conducted a technical visit to ANSTO.

* Please refer to P13 for more details about this project.

Radiation Safety & Radioactive Waste Management Project

Boosting Safety Literacy in Asia through Sharing Information and Knowledge on Radiation Safety and Radioactive Waste

FNCA Consolidated Reports and biannual Newsletters

Plans for introducing nuclear power generation programs are under consideration in various Asian countries. Needless to say, it is essential to promote the exchange of knowledge and empirical information on radiation safety and radioactive waste management is vital to ensureing and enhanceing nuclear safety. The Radiation Safety and Radioactive Waste Management project dispatched several Japanese experts to countries that are participating in this project, and carried out "task group activities" for implementing field surveys on spent radiation source management, TENORM (Technologically Enhanced Naturally Occurring Radioactive Materials) management and the decommissioning and clearance of nuclear installations (2001 to 2007). All the activities contributed to boosting safety consciousness and techniques significantly by providing concrete advice and recommendations appropriate for the actual situation of each country.

As part of our activity, we currently publish "FNCA Consolidated Report" as to the subject matters to be dealt with in each phase. The reports summarize the issues and actual situations of each country, thereby promoting mutual understanding and raising the knowledge level. We also publicize the consolidated reports on the FNCA website, providing detailed information on Asia for non FNCA-participating countries and international organizations, such as IAEA. To bolster cooperation with international organizations, for example, we held a joint session between the Third Asian and Oceanic Congress on Radiation Protection (AOCRP-3) and the FNCA Radiation Safety and Radioactive Waste Management project in our 2010 workshop (in Tokyo), holding a panel discussion. We thus place importance on the exchange of information and opinions with other organizations of the world.

In the 2018 workshop, participating countries shared information on the actual situations of their low-level radioactive waste repository and issues with those sites. They also had a discussion on public acceptance (PA) in site selection.

Visit to a radioactive waste disposal facility in a task group activity (Vietnam in 2007)

Visit to a biofertilizer plant in a workshop activity (Thailand in 2009)

Biofertilizer Project

Promoting Eco-Friendly, Sustainable Agriculture by Applying Radiation Sterilization Technology to Develop High-Quality Microbial Fertilizers

Various types of microorganisms exist in soil. Root nodule bacteria, mycorrhizal fungi, and other types of microorganisms live in symbiosis with plants and serve useful functions for plant growth by supplying nutrient sources. Those bacteria have long been used in agriculture as microbial fertilizers (biofertilizers).

In the FNCA Biofertilizer project, we have developed high-quality biofertilizers by applying radiation sterilization to their production process. With the purpose of establishing sustainable agriculture harmonious with the environment, we have implemented activities for years to develop multifunctional biofertilizers highly-effective in both plant growth and disease tolerance in order to reduce the use of chemical fertilizers.

Through the activities implemented during the 15-year period since the start of the project in 2002, various types of biofertilizer products have been developed and widely used in each country. We have published newsletters containing the latest information on the research and development implemented in each country, biofertilizer manuals for sharing information and empirical knowledge on the production and utilization of biofertilizers in Asia and guidelines for quality assurance and management of biofertilizers (two volumes in total). Those materials are publicized on the FNCA website.

In FY2016, we started joint work on an Electron Accelerator Application project, which had been implemented in the area of utilization in agriculture. In FY2018, our project was integrated with the Electron Accelerator Application project, and we started new activity as Radiation Processing and Polymer Modification project.

Major biofertilizers developed in each country

Bangladesh Team Won the "Best Research Team of the Year"

Dr. Md Humayun Kabir, BAEC (right) received the trophy for the “Best Research Team of the Year” from Dr. Yoshiaki Oka, Chairman of JAEC (left)

Best Research Team

Mutation Breeding Project
Bangladesh

Representative: Dr. Md Humayun Kabir
Bangladesh Atomic Energy Commission

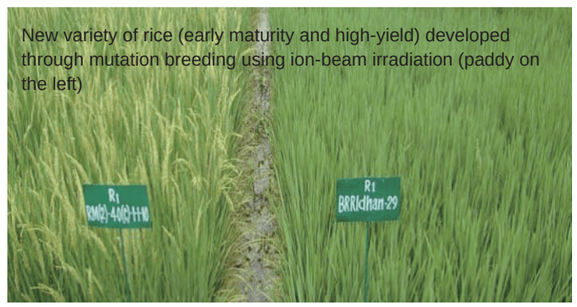
Mutation Breeding Project of FNCA aimed for breeding technology with major crops using irradiation either by gamma-ray or by ion-beam. The objectives are to develop new crop varieties with higher yield or yield contributing attributes for low-input Sustainable Agriculture under adverse climatic condition in Asiatic regions.

We are facing severe threat of climate change challenges in crop sector. Drought tolerant rice variety with long grain fine rice, BINA dhan-19 was developed from NERIKA-10 through ion-beam irradiation. High yield with early maturity BINA dhan-18 was also released upon carbon ion beam radiation of BRRI dhan-29. Lodging resistant, early maturing, higher yield and photo period insensitive BINA dhan-14 was released late 2013 using ion beam irradiation from QST, Takasaki, Japan of indigenous rice Ashfal.

Such project like FNCA mutation breeding provided technical co-operation, organized research and development activities in the member states in enhancing crop genetic diversity, development of new techniques & germplasm and facilitated the exchange of information. FNCA mutation breeding project team of Bangladesh and Bangladesh Atomic Energy Commission with related personnel involved in this area of research are very much grateful to FNCA for nominating this team as 2018 FNCA Best Research Team of the Year Award.

Our research team is currently working on improving some other indigenous rice variety which will contribute to the sustainable agriculture in the country. I believe that international cooperation is very important for the sustainable progress of the research related to this field.

Key staffs involved in the project in Bangladesh
Dr. Md Humayun Kabir (left end in the first row)
Project Leader: Dr. A N K Mamun (center in the first row)



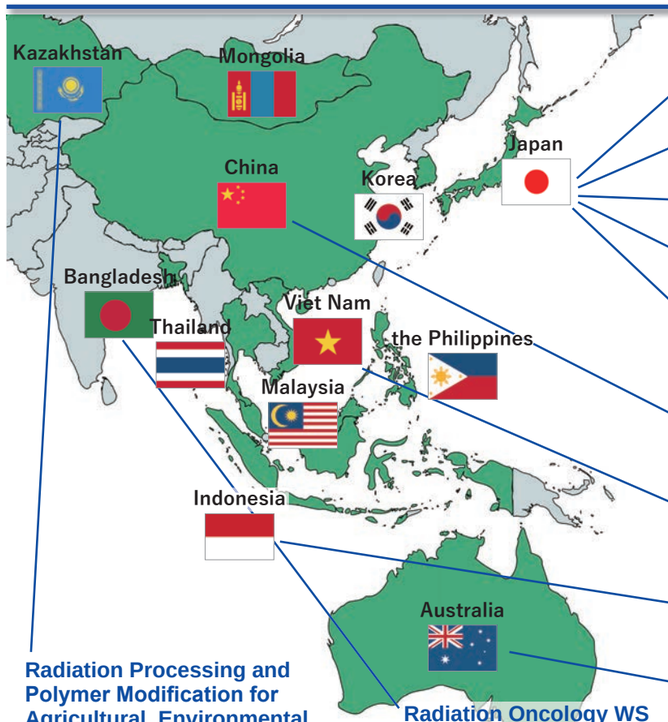
New variety of rice (early maturity and high-yield) developed through mutation breeding using ion-beam irradiation (paddy on the left)

Excellent Research Team of the Year

“Excellent Research Teams of the Year” were awarded to following three projects of the two countries, in recognition of their achievement next to the Best Team.

- Thailand: Radiation Safety & Radioactive Waste Management Project
- Indonesia: Research Reactor Utilization Project
- Thailand: Electron Beam Accelerator Application Project

Activities in JFY 2018



The 19th Senior Officials Meeting
July 19, 2018, Tokyo

The 19th Ministerial Level Meeting
December 6, 2018, Tokyo

The 20th Coordinators Meeting
March 6, 2019, Tokyo

2019 Study Panel
March 7, 2019, Tokyo

Research Reactor Utilization WS
October 22 - 25, 2018, Fukui & Osaka

Nuclear Security and Safeguards WS
September 11 - 13, 2018, China

Mutation Breeding WS
October 29 - November 1, 2018, Vietnam

Climate Change Science Research WS
September 24 - 28, 2018, Indonesia

Radiation Safety and Radio Active Waste Management WS
October 17 - 19, 2018, Australia

Radiation Processing and Polymer Modification for Agricultural, Environmental and Medical Application WS
October 8 - 12, Kazakhstan

Radiation Oncology WS
November 4 - 7, 2018
Bangladesh

List of Coordinators

Country	Name	Affiliation
	Ms. Lynn TAN	Adviser, International Affairs Australian Nuclear Science &Technology Organisation (ANSTO)
	Mr. Mahbubul HOQ	Chairman, Bangladesh Atomic Energy Commission (BAEC)
	Mr. LIU Yongde	Secretary General, China Atomic Energy Authority (CAEA)
	Dr. Hendig WINARNO	Deputy Chairman of BATAN for Nuclear Technology Utilization National Nuclear Energy Agency (BATAN)
	Mr. Tomoaki WADA	Chief Executive Director, Kobe Science Museum
	Prof. Erlan G. BATYRBEKOV	Director General National Nuclear Center of the Republic of Kazakhstan
	Ms. Eun Kyoung JEE	Director, Space, Nuclear and Big Science Cooperation Division Ministry of Science and ICT (MSIT)
	Dr. Abdul Muin Bin ABDUL RAHMAN	Deputy Director General (Technical Service Program) Malaysian Nuclear Agency (Nuclear Malaysia)
	Mr. Chadraabal MAVAG	Head, Nuclear Technology Department Nuclear Energy Commission (NEC)
	Dr. Lucille V. ABAD	Chief, Atomic Research Division, Department of Science and Technology, Philippine Nuclear Research Institute (PNRI)
	Dr. Pornthep NISAMANEEPHONG	Executive Director Thailand Institute of Nuclear Technology (TINT)
	Dr. TRAN Ngoc Toan	Vice President, Vietnam Atomic Energy Institute (VINATOM)

Mita Kaigisho, Tokyo, March 22, 2018

Project Evaluation and Discussion about New Proposals

The Japan Atomic Energy Commission held the 19th FNCA Coordinators Meeting in Tokyo on March 22, 2018, co-sponsored by the Ministry of Education, Culture, Sports, Science and Technology. In the meeting, 11 FNCA member countries (Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, Philippines, Thailand, Vietnam) and the representatives of regional offices of the Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology (IAEA/RCA) participated.

■ Summary of the Meeting

- The representatives of the current eight projects of FNCA reported their annual activities. Out of them, the results and future perspectives of three projects (Mutation Breeding, Biofertilizer, and Electron Accelerator Application), which will end their implementation periods in FY2017, were explained.
- The participants discussed new proposed projects according to the project evaluation framework and agreed to start a new project ("Radiation Processing and Polymer Modification for Agricultural, Environmental and Medical Applications"), which mixes the two conventional projects that will end in FY2017 (Biofertilizer and Electron Accelerator Application), and a new phase of Mutation Breeding from FY2018.
- In addition, as a new project, the research project "Research and Development on Risk Communication Strategy for Nuclear Power Plant or Research Reactor Project" was proposed. Though it was passed up, it was recommended that the proposal be re-proposed after the review of its contents for improvement at the next Coordinators Meeting.
- Regarding the budgetary measures for the new projects, the necessity to review and amend the existent regulations was brought up, and it was decided to review those at Senior Officials Meetings in due course.
- RCA provided a presentation regarding RCA activities and the relationship between RCA and FNCA and confirmed their continued and strengthened mutual research cooperation.

Deepening Understanding of Member Countries through Cooperation among International Agencies in Nuclear Energy-related Legal Area


Dr Yoshiaki Oka, Chairman of JAEC (left) and Mr Toshio Sano, Commissioner of JAEC (right)

The Japan Atomic Energy Commission, in cooperation with the Organization for Economic Co-operation and Development / Nuclear Energy Agency (OECD/NEA), held its 2018 Study Panel in Tokyo on March 23, 2018. In this meeting, 11 FNCA member countries (Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, Philippines, Thailand, Vietnam) and representatives from OECD/NEA, the U.K. and the U.S. participated.

In this meeting, under the main theme of "Enhancement of domestic measures in the field of nuclear law," the participants conducted presentations and Q&A regarding the two topics of "Legal Framework of Nuclear Safety" and "Legal Framework of Public Participation" and shared the situations and knowledge of each country and agency with the participation of the related agencies in the U.S. and U.K. and related legislative researchers in Japan.

■ Summary of the Meeting

Mr. Toshio Sano, the Commissioner of the Japan Atomic Energy Commission, who served as the chairperson of the meeting, summarized the meeting as follows:

- The knowledge, suggestions, advice, and recommendations provided through the presentations by 18 lecturers and reporters were all fruitful, and I think that the primary goal of this meeting, which is the understanding and sharing of knowledge by participants through active dialogues, has been achieved.
- Our reaffirmation of the importance of keeping regulated organizations independent regarding nuclear security will contribute to the future organization of regulations in FNCA member countries.
- Public participation will expand not only problems in each country but also problems of information disclosure among adjacent countries. They are also practical problems among FNCA member countries and common issues for the future.
- As the chairperson of the meeting, I would like to express my hearty thanks for active participation of the participants of today's meeting and hold a meeting again under the same theme in the future to share the progress of the initiatives in each country.

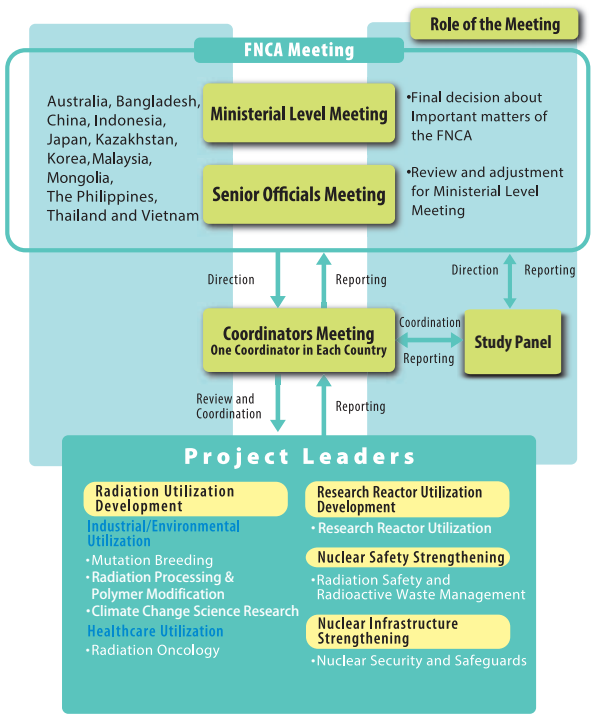
Mita Kaigisho, Tokyo, March 23, 2018

What's FNCA?

What is FNCA (Forum for Nuclear Cooperation in Asia)?

FNCA is a framework for international cooperation for the peaceful use of atomic energy, led by the Cabinet Office and Ministry of Education, Culture, Sports, Science and Technology of Japan. Twelve countries, i.e. Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Korea, Malaysia, Mongolia, The Philippines, Thailand, and Vietnam, are conducting collaborative activities under equal partnership for joint research on nuclear science and technology, information exchange, and support for nuclear power infrastructure development.

The FNCA Framework



Ministerial Level Meeting

A meeting of ministerial level representatives who are in charge of science and technology policy and supervising nuclear energy and radiation uses. FNCA's cooperation policies and nuclear energy policies of the member countries are discussed in this meeting.

Senior Officials Meeting

Senior officials from member countries have preliminary discussion on the agenda for the Ministerial Level Meeting.

Coordinator's Meeting

A coordinator is appointed for each member country to oversee FNCA project activities in various nuclear fields. Coordinators gather to assess the progress of individual projects and discuss their results, evaluations, future policies and general management of FNCA.

Study Panel

In the Study Panel, senior officials and experts from the FNCA member countries discuss on nuclear policy/technical matters of both power and non-power areas of nuclear energy with a view to applying such knowledge to domestic and international activities.

Projects

For eight projects in four areas associated with radiation utilization and nuclear power infrastructure, the FNCA member countries take turns holding a workshop or an open seminar to discuss achievements and the plans of activities.

The Focused Data

FNCA in figures

19 **Number of Ministerial Meetings**

Host Countries: Thailand, Japan, Korea, Vietnam, Malaysia, the Philippines, China, Indonesia, Australia, Kazakhstan,

* Japan hosted 10 meetings in total and the others hosted one meeting respectively.

12 **Number of Member Countries**

Name of Countries (in alphabetical order): Australia, Bangladesh, Bangladesh, China, Indonesia, Japan, Kazakhstan, Korea, Malaysia, Mongolia, the Philippines, Thailand, Vietnam

* Bangladesh participated in 2006, and Kazakhstan and Mongolia in 2010

22 **Number of Workshops held in Japan**

Prefectures & Number: Ibaraki: 3, Tokyo: 4, Gumma: 4, Chiba: 2, Okayama: 1, Fukui: 4, Aomori: 3, Osaka: 1

* In case of multiple venues, prefecture with higher number of workshop days shall be included in the above. Joint Workshops by 2 projects are counted as 2 workshops.

44 **Number of Research Reactors in Member Countries**

Australia: 1, Bangladesh: 1, China: 16, Indonesia: 3, Japan: 14, Kazakhstan: 3, Korea: 3, Malaysia: 1, Thailand: 1, Vietnam: 1

* Excluding reactors under planning, dismantling, decommissioning or set to be decommissioned.

FNCA
Forum for Nuclear Cooperation in Asia

FNCA Search

http://www.fnca.mext.go.jp/english/index.html

NSRA
International Affairs & Research Dep.,
Nuclear Safety Research Association (NSRA)
5-18-7, Shimbashi, Minato-ku, Tokyo, 105-0004
TEL: +81-3-5470-1983/FAX: +81-3-5470-1991

This newsletter is issued by Nuclear Safety Research Association (NSRA) under the contract with the Ministry of Education, Culture, Sports, Science and Technology (MEXT)