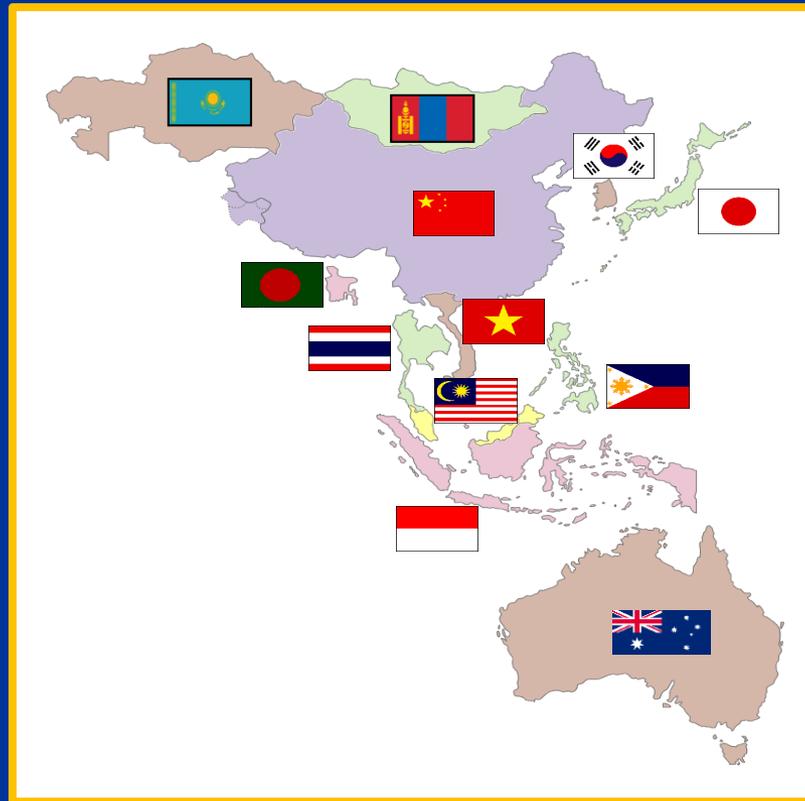


# Overview and Progress of FNCA Activities in 2015

12 Member Countries

Australia  
Bangladesh  
China  
Indonesia  
Japan  
Kazakhstan



Korea  
Malaysia  
Mongolia  
Philippines  
Thailand  
Viet Nam

38 RCA NRM  
Ulan Bator

Hideki NAMBA  
FNCA Advisor of Japan  
Advisor to MEXT

May 19, 2016

# Condolences on the passing away of Dr. Sueo Machi

Dr. Sueo Machi, the former FNCA Coordinator of Japan has passed away on August 15, 2015.



**1980-1983 Section Head of Industrial Applications and Chemistry, DPCS, IAEA-NA**

**1989-1991 Director General, JAERI-Takasaki**

**1991-2000 Deputy Director General, IAEA**

**2000-2015 FNCA Coordinator of Japan**

# About FNCA

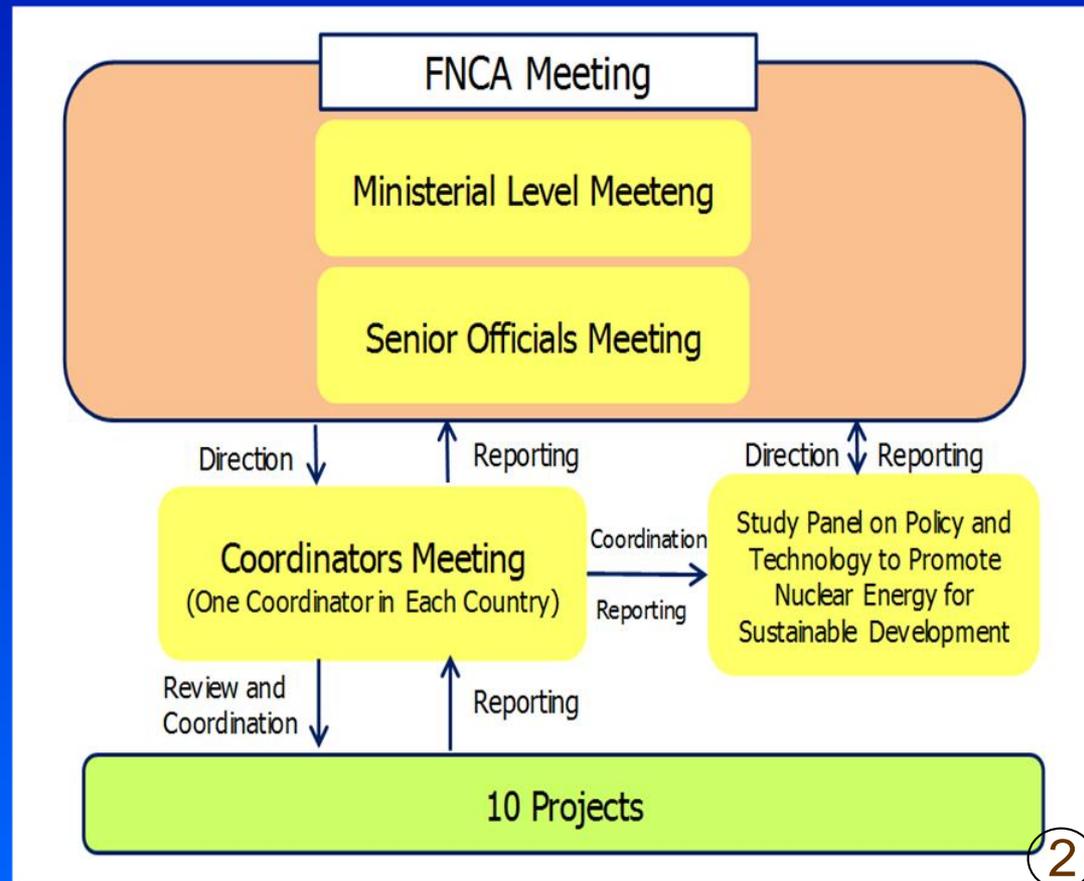
## **【Outline】**

FNCA (Forum for Nuclear Cooperation in Asia) is a framework for international cooperation in Asian countries toward the peaceful use of nuclear technology established in 2000.

12 countries promote cooperative activities based on equal partnership.

## **【Member Countries】**

Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Korea, Malaysia, Mongolia, the Philippines, Thailand and Vietnam



# 16<sup>th</sup> FNCA Ministerial Level Meeting

## [Major Agenda]

8 December 2015, Tokyo Japan

- ◆ Keynote speech  
by Mr. Magwood, Director General of OECD/NEA
- ◆ Country Report  
from all countries about the energy policy including nuclear energy  
and the research on the use of radiation
- ◆ Round table discussion  
“New Activities Related to Climate Changes and the Role of Nuclear  
Technology” and “Reform of FNCA”
- ◆ Adaption of Joint Communiques



## Related to the activities of IAEA/RCA and OECD/NEA in the Joint Communiqués

### [IAEA/RCA]

Appreciating the role of the IAEA/RCA as an effective tool for the promotion and coordination of research and development activities to respond to the needs for national development through utilizing regional experiences, expertise and resources in nuclear applications

### [OECD/NEA]

Welcoming the appeal by the OECD/NEA Director General for possible new collaboration between the NEA and the FNCA made at this MLM, aiming at the enhancement of the collaboration of OECD/NEA with Asian countries

# Decided to work toward on the New Direction of FNCA in the Joint Communiques

## Action Item 1. Themes and activities to be promoted

- Launching a new research project on climate change utilizing nuclear science and technology in 2017.
- Further advancing FNCA's nuclear infrastructure projects/themes related to human resources development and nuclear safety, taking into account the role of nuclear energy in mitigating climate change.
- Further advancing FNCA's nuclear application projects, such as mutation breeding project which could contribute as an adaptive response to climate change, for sustainable development.
- Further advancing the radiation oncology project which can bring common benefits in the region.
- Enhancing the activities related to building trust toward nuclear technology through stakeholder engagement and improved communication with public, and enhancing national regimes for the compensation of nuclear damage, including consideration of adherence to the international conventions.

# Decided to work toward on the New Direction of FNCA in the Joint Communiques

## Action Item 2.

Promoting cooperation with international organizations such as IAEA and OECD/NEA, for enhancing FNCA's key role and for mutually benefitting from the strength of both those parties.

## Action Item 3.

Improvement of the management of FNCA activities, considering urgent necessity of enhancing effectiveness and efficiency of the FNCA work in order to meet the needs of member countries.

## Action Item 4.

Diversification of financial resources and further encouragement of the utilization of the results of the projects/themes.

# 17<sup>th</sup> FNCA Coordinators Meeting

## [ Major Agenda ]

4-5 Mar. 2016, Japan

- ◆ Summary Report of the FNCA MLM in 2015
- ◆ Report of 10 Projects Activities in 2015
- ◆ IAEA/RCA Activities Reports and Cooperation with FNCA
- ◆ Follow-up on activities based on the Joint Communiques of the 16<sup>th</sup> MLM
- ◆ Review of Mutation Breeding & Neutron Activation Analysis Projects



# 1. Projects for Applications of Radiation and Isotopes

- Research Reactor Utilization
  - (1) Neutron Activation Analysis (NAA)**
  - (2) Research Reactor Network (RRN)**
- Sustainable Agriculture
  - (3) Mutation Breeding**
  - (4) Biofertilizer**
- Industrial Application (Radiation Processing of Natural Polymers)
  - (5) Electron Accelerator Application**
- Improving Medical Care
  - (6) Radiation Oncology**

## 2. Projects for Building Infrastructure

- Nuclear Safety Strengthening
  - (7) Safety Management Systems for Nuclear Facilities**
  - (8) Radiation Safety and Radioactive Waste Management**
- Nuclear Infrastructure Strengthening
  - (9) Human Resources Development**
  - (10) Nuclear Security and Safeguards**

## 3. Study Panel

- Building trust toward nuclear technology through stakeholder engagement, improved communication with public

# 1. Projects for Applications of Radiation and Isotopes

- Research Reactor Utilization
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# Project on Neutron Activation Analysis (NAA)

## [ Element Analysis with NAA ]

### Subproject of phase IV (2011-2014)

1. **Geochemical** samples for Geochemical **mapping** and mineral exploration
2. **Food samples** (tea, rice, fish) for **Contamination** monitoring
3. **Marine Sediment** samples for **Environmental** monitoring

### Subproject of phase V (2015-2017)

1. **Suspended Particle Material (SPM)** including PM-2.5 for **air pollution** monitoring
2. **Rare Earth Element (REE)** for **exploration of natural resources**



Workshop in Korea, Nov. 4-6, 2015 1

# Project on Research Reactor Network

## Project Objectives

- ◆ To achieve **efficient utilization of research reactor** by sharing experience and knowledge on radioisotope production and radiation technology
- ◆ To explore the possible **establishment of FNCA regional network for the stable supply of isotopes** such as Mo-99 and Co-60
- ◆ To share **experience and knowledge on new research reactor design and application** in terms of safety, economics and efficiency

## Reports and discussions during the Workshop Research/test reactor utilization and isotope production

- Status and application of research reactor
- **Stable supply of radioisotopes for medical use**
- Mo-99 Production for Stable Supply, and other RI production status
- Production technology of Mo-99 by n-gamma reaction

## Possible cooperation for multi-purpose research reactors

- preparing detailed catalog of multi-purpose research reactor including beam facilities, irradiation facilities



**The 5th Project Workshop:  
Malaysia, 27-29 Oct. 2015**

# 1. Projects for Applications of Radiation and Isotopes

- Research Reactor Utilization
  - (1) Neutron Activation Analysis (NAA)
  - (2) Research Reactor Network (RRN)
- Sustainable Agriculture
  - (3) Mutation Breeding**
  - (4) Biofertilizer**
- Industrial Application (Radiation Processing of Natural Polymers)
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- Improving Medical Care
  - (6) Radiation Oncology

# Radiation Utilization Development for Agriculture



Without enough **Sunshine**



Without enough **Water**



Without enough **Fertilizer**

**Diseases & Insects**



**【Mutation Breeding Project】** Development of **New Varieties**

**【Biofertilizer Project】** Development of **Biofertilizer**

**【Electron Accelerator Application Project】**

Development of **Super Water Absorbent**

Development of **Plant Growth Promotor**

# Project on Mutation Breeding

## Mutation Breeding of Rice for Sustainable Agriculture

### Object of the Project

- ◆ To develop new varieties of rice by mutation breeding using gamma rays and ion beams
- ✓ high yields using less fertilizer and chemicals
- ✓ resistance to various environmental stress, e.g. diseases, insects, drought, flood, etc.



WS in Mongolia, 31 Aug. – 3 Sept., 2015

Prof. Liu Luxiang  
LCC of IAEA/RCA Project RAS5056

# Project on Mutation Breeding

**Bangladesh**



*BINA dhan-14*



**BINA dhan-14 Display field**

Tolerant to **drought** (25-30% less water needed), **early heading**, **short culm**, and **high yield** (6.9t / ha) BINA Dhan 14 was registered in 2013. Derived from the original variety with ion beam irradiation

# Project on Mutation Breeding

Vietnam



Mutant

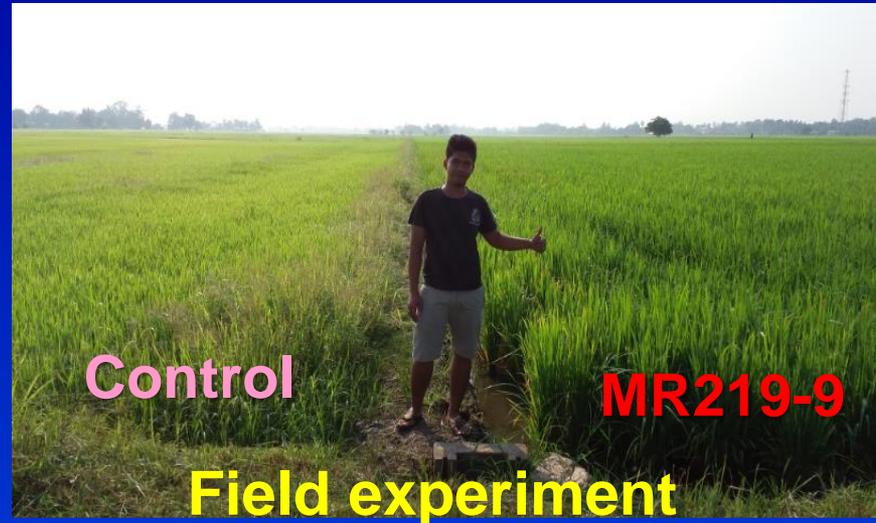
Original Variety

High yielding and early mature mutant variety DT80 (Left) derived from the original variety TL6.2 (Right) having salt tolerance, with gamma rays irradiation

# Project on Mutation Breeding

Malaysia

Tolerance to drought



Tolerance to blast



MR 219-9 mutant in M5, tolerant to drought, blast with high yield, being registered as commercial variety NMR152

# Project on Mutation Breeding

Thailand

Before submerging

14 days submerging



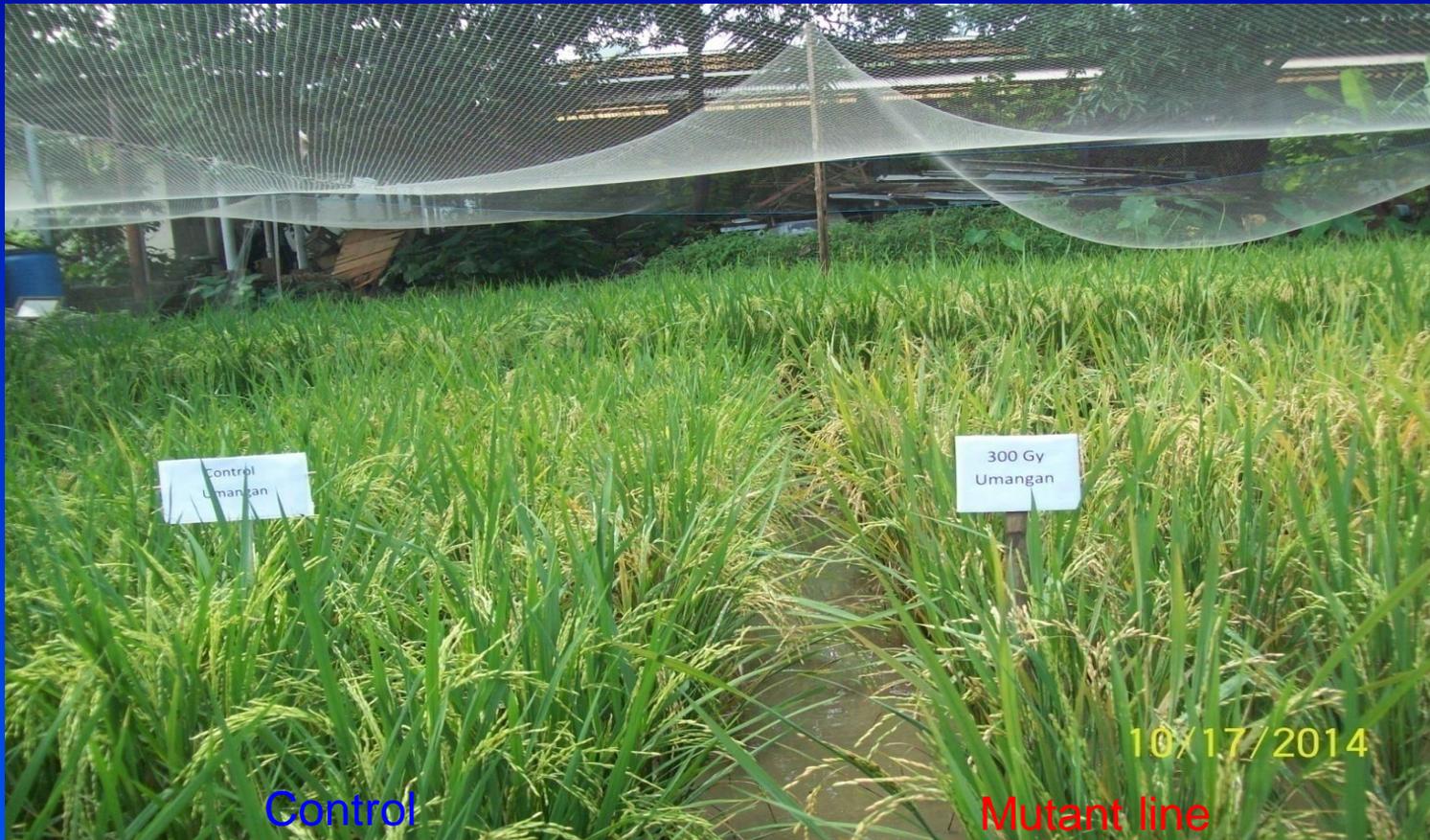
20 days after de-submerge

2 days after de-submerging

Breeding for **tolerance to flood** in M3-M4 generation in 2015

# Project on Mutation Breeding

## The Philippines



**Early maturing** mutant line (in M3) derived from native variety, Umangan(Control). Screened in organic farming condition with **carrageenan** sprayed

# Project on Biofertilizer

## Object of the Project

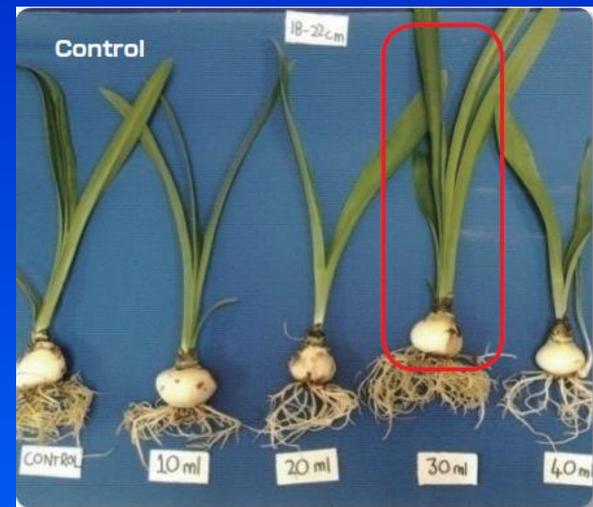
- ◆ to reduce the amount of chemical fertilizer input without decreasing yield of crops, by using function of beneficial microbes in biofertilizer with radiation sterilization carrier

## Recent Achievements

- Biofertilizers using radiation sterilization carriers were commercialized in Bangladesh, Malaysia and the Philippines.



Liquid biofertilizer developed and commercialized by Malaysian Nuclear Agency

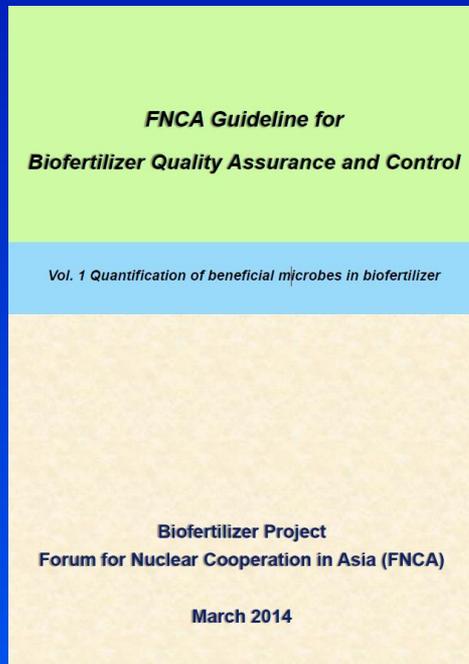


Up to 65% growth of Amaryllis Leaves using liquid biofertilizer

# Project on Biofertilizer

## Recent Achievements

- Development of FNCA guideline for biofertilizer quality analysis



FNCA Guideline Vol.1 Quantification of Beneficial Microbes in Biofertilizer for Quality Assurance and Control

Workshop in Thailand, 24-27 Nov., 2015



with biofertilizer

without

Sugarcane fields with PGPR (Plant Growth Promoting Rhizobacteria) biofertilizer in Suphan buri province, Thailand

# Project on Electron Accelerator Application

## Object of the Project

- ◆ to encourage the use of electron accelerators and gamma rays in industry through the commercialization of products

## Present Subproject: 5<sup>th</sup> Phase (JFY2015-2017)

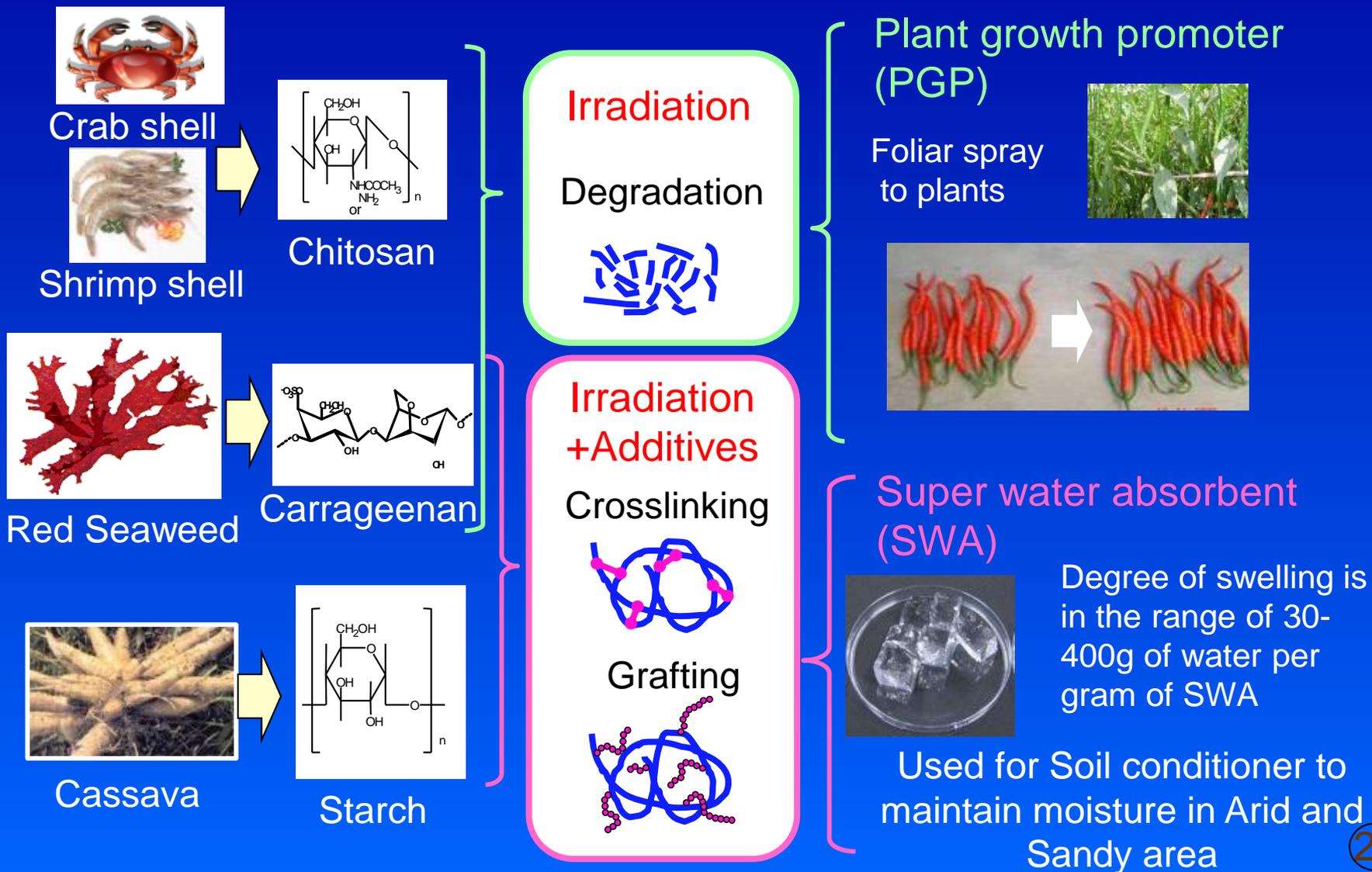
### Radiation Processing of Natural Polymers

- Plant growth promoter (PGP)/Elicitor
- Super water absorbent (SWA):  
Soil conditioner to retain water longer used in semi-arid and arid region



# Project on Electron Accelerator Application

Raw materials: Indigenous natural polymers



# Project on Electron Accelerator Application

PGP

## Effect of Growth Promotion on Plants



More sweetness  
Expensive Fruits (Thailand)  
6 \$/ kg  
(Exported Price 18\$/kg)

Reduction of Fungal diseases by foliar spray of PGP (Elicitor)



Environment-friendly and safety Fungicide



Rice



Sheath blight by *Rhizoctonia*



Cyclamen



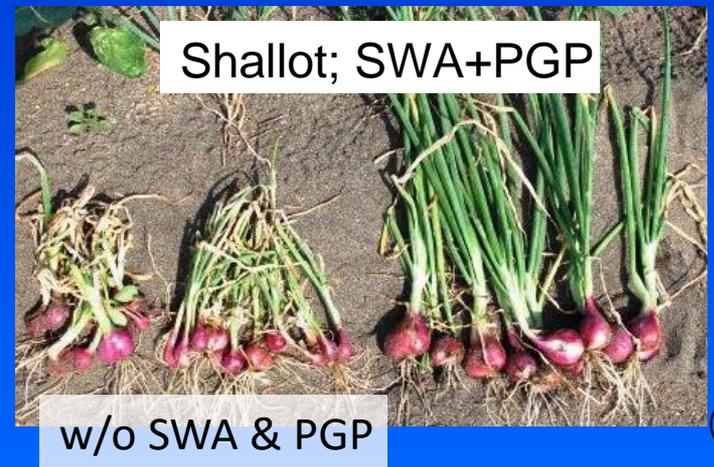
Damage by *Fusarium*

# Project on Electron Accelerator Application

## SWA



SWA enable farmers to save watering and increase yield in sandy soil



# Project on Electron Accelerator Application

## Recent Achievement

Thailand

### TINT

Oligochitosan



### PGP

A production plant of PGP with the capacity of 50,000 L/month was set up at Thai Gamma Irradiation Center (Prathumthanee Province)



### SWA

Production plant of SWA was set up in Gamma Irradiation Facility with the capacity of 200 kg/day.



# Project on Electron Accelerator Application

Recent Achievement

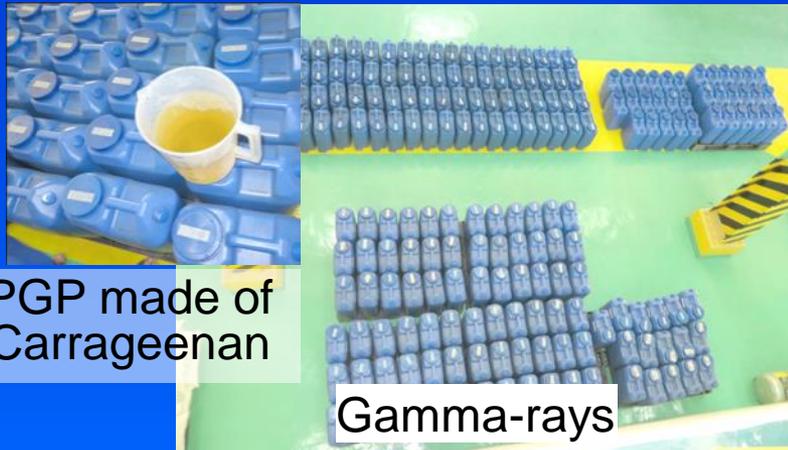
The Philippines

Improved lodging to withstand typhoons



*Standing rice in PGP-treated field*

*Lodged rice in Farmer's practice*



PGP made of Carrageenan

Gamma-rays



Electron Beam

Planning of process development for PGP production (600,000L) with EB to supply PGP to field testing for rice in 67,000ha

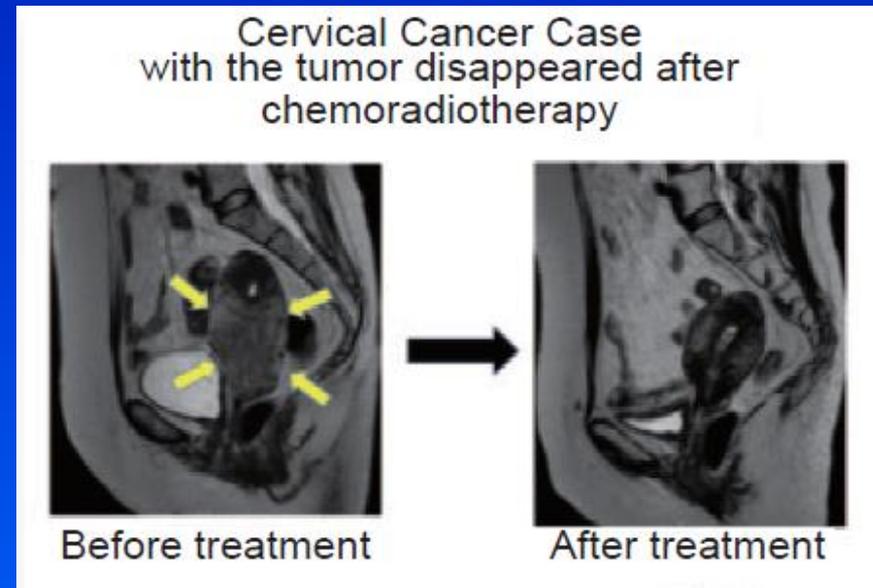
# Project on Radiation Oncology

## Object of the Project

- ◆ To increase the level and popularization of radiation treatment on cancers with high morbidity rate in Asia, e.g. cervical cancer, nasopharyngeal cancer, and breast cancer

## Recent Achievements

- Development of protocols for cancers and wide use of them as standard treatment (Bangladesh, China, Indonesia, Japan, Korea, Malaysia, Thailand and Vietnam)
- ✓ Improvement of the survival rate for patients treated by new protocol “Cervix IV” (5 year overall survival rate: 69% / local control rate : 92%)



# Project on Radiation Oncology

## Recent Achievements

- Quality assurance and quality control (QA/QC) of external radiation therapy
  - ✓ The dose audits for external beam were performed for 46 beams at 16 facilities in 11 countries, between JFY2006 and JFY2014.
- Co-operation with IAEA/RCA
  - ✓ A total of 12 observers from IAEA/RCA member countries have participated in FNCA workshops, sharing with the information on each other projects from JFY2010.



Dose audit and technical guidance for QA/QC external radiation therapy in Indonesia



Workshop in Vietnam,  
1-4 Dec., 2015

## 2. Projects for Building Infrastructure

- Nuclear Safety Strengthening
  - (7) Safety Management Systems for Nuclear Facilities**
  - (8) Radiation Safety and Radioactive Waste Management**
- Nuclear Infrastructure Strengthening
  - (9) Human Resources Development
  - (10) Nuclear Security and Safeguards

## 3. Study Panel

- Building trust toward nuclear technology through stakeholder engagement, improved communication with public

# Project on Safety Management System (SMS)

## Project Objectives

- ◆ To identify key aspects of SMS for nuclear facilities
- ◆ To develop self assessment and peer review methods for SMS
- ◆ By mutual agreement, to undertake peer reviews at designated institutes in conjunction with annual workshop

## Workshop and Peer Review

- 2010: Indonesia, 2011: Malaysia, 2012: Korea, 2014: Bangladesh
- 2015: Dalat, Vietnam



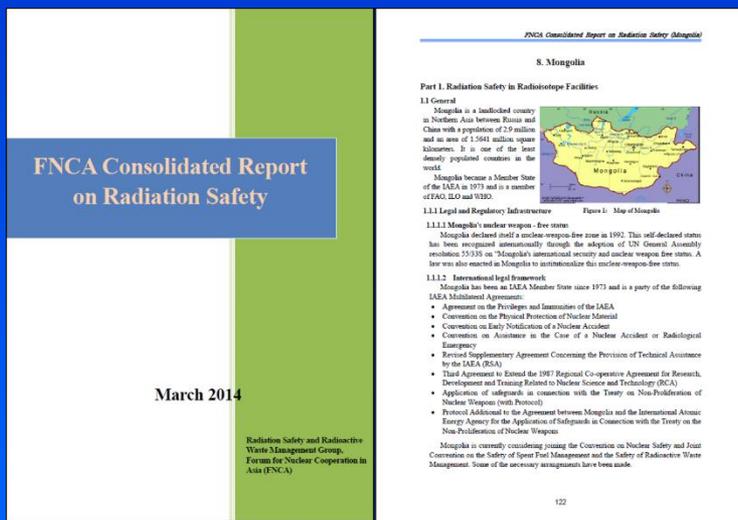
The 5th Project Workshop and Peer Review:  
Vietnam, 8-12 June, 2015

# Project on Radiation Safety and Radioactive Wastes Management (RS&RWM)

## Project Objectives

- ◆ To enhance Radiation Safety and Radioactive Wastes Management among participating FNCA countries through sharing information, knowledge and experience of existing technologies

- Workshop: November 17-19, 2015, in Indonesia
- Consolidated Report on Nuclear/ Radiological Emergency Preparedness and Response



- Publication of RS&RWM Newsletter



## 2. Projects for Building Infrastructure

- Nuclear Safety Strengthening
  - (7) Safety Management Systems for Nuclear Facilities
  - (8) Radiation Safety and Radioactive Waste Management
- Nuclear Infrastructure Strengthening
  - (9) Human Resources Development**
  - (10) Nuclear Security and Safeguards**

## 3. Study Panel

- Building trust toward nuclear technology through stakeholder engagement, improved communication with public

# Project on Human Resources Development

## Project Objectives

- ◆ To provide assistance to human resources development for nuclear power generation and radiation application in order to enhance the nuclear skills and management throughout Asia.

## Workshop

19-21 August, 2015, Fukui, Japan

FNCA - Asian Nuclear Training and Education Program

FNCA-ANTEP

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FNCA HRD Database  
By Cabinet Office of Japan  
(FY 2008-2010)

Operated by [Nuclear Safety Research Association](#)

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# Project on Nuclear Security and Safeguards

## Project Objectives

- ◆ To share experience, knowledge and information on nuclear security and safeguards implementation including human resource development and R&D
- ◆ To exchange views on policy, strategy and frame work for nuclear security and safeguards

The 5th Project Workshop: 9-11 September, 2015, Semey, Kazakhstan



# 3. Study Panel

Theme: Building trust toward nuclear technology through stakeholder engagement, improved communication with public

10 March, 2016, Tokyo, Japan

## 1. Keynote speech

- The activities of the Nuclear Energy Agency (NEA) related to stakeholder involvement (OECD/NEA)
- Stakeholder Involvement –An Overview- (IAEA)

## 2. Stakeholder engagement relating to a plan for establishing Nuclear Facilities

- Transparency and Trust - Local residents' perspective - (Japan)
- Hosting Nuclear Power Plants and Regional Development in Fukui Prefecture (Japan)
- Australia's experience - A new approach to stakeholder engagement for nuclear facilities (Australia)

## 3. Stakeholder engagement relating to low-level Radioactive Waste

- Australia's experience – stakeholder engagement relating to nuclear waste (Australia)
- Initiatives to Live in Harmony with Local Communities for the Nuclear Fuel Cycle Facilities (Japan)

## 4. Reconstruction of trust relating to restart of the Nuclear Power Station

- Sendai Nuclear Power Station, Promotion of understanding toward restarting (Japan)

# FNCA and RCA Cooperation to Enhance Possible Synergy

## 1. Designated Projects for the cooperation

- Mutation Breeding
- Radiation Oncology
- Radiation Processing of natural polymers

## 2. Reciprocal participation in RCA NRM and FNCA CDM

## 3. Challenges

- **Increasing participation** of non-FNCA RCA countries to FNCA Project Workshops
- **Synergy** of FNCA and RCA activities is practically achieved in some member countries in R/D projects
- **FNCA NAA sub-project on PM-2.5** analysis is complementary to RCA Air Pollution Monitoring (RAS7023) using PIXE analysis

# Thank you for your kind attention!

*Please visit FNCA website!  
( <http://www.fnca.mext.go.jp/> )*

Hideki Mamba, FNCA Advisor of Japan  
Advisor to MEXT, Technical Advisor to RADA  
[Namba.hideki@rada.or.jp](mailto:Namba.hideki@rada.or.jp)

The screenshot displays the FNCA website interface. At the top, the logo 'FNCA Forum for Nuclear Cooperation in Asia' is visible, along with a 'Japanese Top' button and utility links for 'Contact Us', 'Link', and 'Site Map'. A horizontal navigation menu includes 'TOP', 'About FNCA', 'FNCA Meeting', 'Coordinators', 'Panel', 'Project', and 'Brochure / Newsletter'. Below the menu is a large banner image showing a group of people at a meeting, with three sub-headers: 'High FNCA Coordinators Meeting Mar 6th - 8th, 2015 Tokyo', 'Electron Accelerator Application Project Feb. 9-11, 2015 Indonesia', and 'Biofertilizer Project Nov. 24-27, 2014 Malaysia'. The main content area is divided into several sections: 'Panel' (describing regional energy and environmental issues), 'Coordinators' (describing the review and coordination of projects), 'Project' (describing cooperation activities like workshops), 'Mutation Breeding' (describing new mutant varieties of crops), and 'Biofertilizer' (describing the development of multifunctional biofertilizers). On the right side, there is a 'The FNCA Framework' diagram showing the flow from 'FNCA Meeting' to 'Coordinators' and 'Panel', and then to 'Project'. A 'Nuclear Security' button is located at the bottom right of the page.