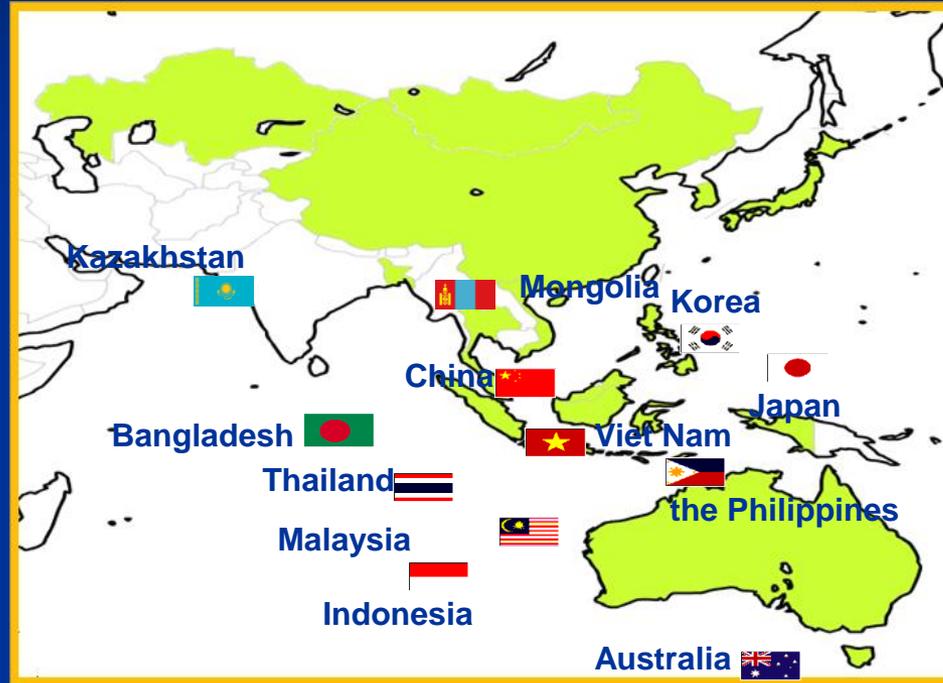


Progress of FNCA Activities in 2014

12 Member Countries

Australia
Bangladesh
China
Indonesia
Japan
Kazakhstan

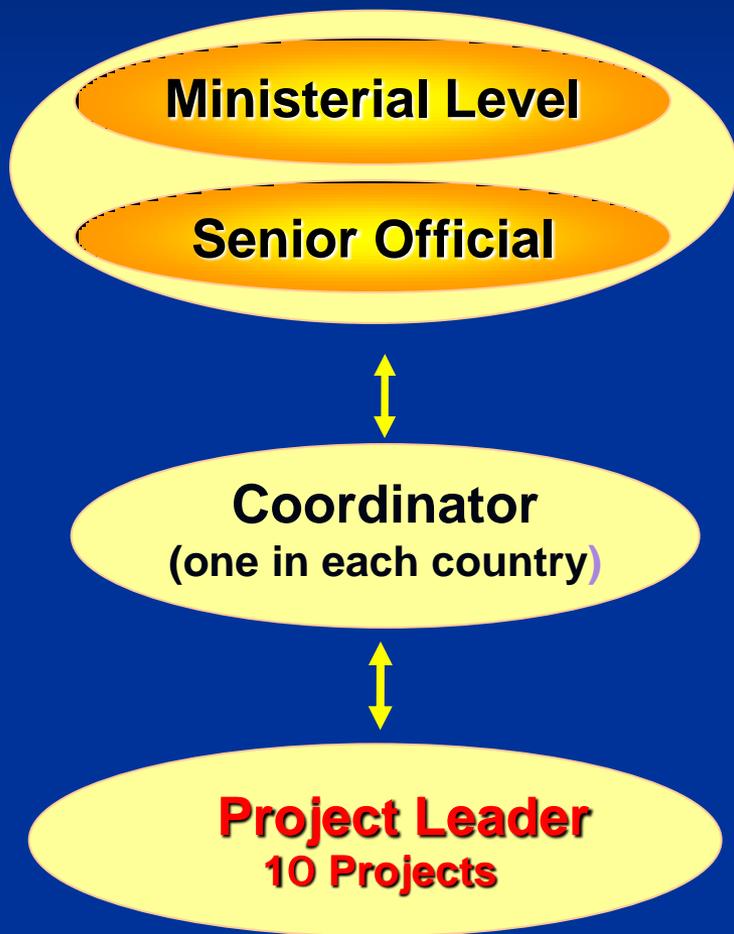


Korea
Malaysia
Mongolia
Philippines
Thailand
Viet Nam

Sueo MACHI
FNCA Coordinator of Japan
Advisor to MEXT

FNCA : Forum for Nuclear Cooperation in Asia

Member Countries: Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Korea, Malaysia, Mongolia, the Philippines, Thailand, Vietnam



FNCA Vision Statement (adopted 2000)

The FNCA is to be recognized as an effective mechanism for enhancing socioeconomic development through active regional partnership in the peaceful and safe utilization of nuclear technology.

Ministerial Meeting (Nov.2010, China)



15th FNCA Ministerial Meeting Chaired by H.E. Mr. Mc Farlen, Minister, Ministry of Industry Nov. 18, 2014, Australia



Major Agenda of 15 FNCA Ministerial Meeting

- Country Statements : Heads of Delegation
- Report of 10 Projects
- Report of **Study Panel Meeting on Nuclear Power**
- Round table discussion on **Strategy for Application of Multi-Purpose Research Reactor**
- Adaption of **Resolution**



H.E. Mr. McFarlane, Minister for Industry, Australia

Major Issues of Resolution

- Encouraging Ministerial Level leadership in designing FNCA future direction to further advance **15 years of achievement** in application of radiation technology for medical care, productive agriculture, industry and environmental protection, and **nuclear power**
- Encouraging the senior officials to **strengthen linkage with their respective stakeholders**, in order to enhance the application of significant outcomes of the projects of mutation breeding, bio-fertilizer and radiation processing of natural polymers for improving agricultural production
- Strengthening effort to make the **high performance research reactors** in the region available to collaborators and trainees of FNCA countries

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**

Improving Medical Care

- (5) Radiation Oncology**

Industrial Application

- (6) Radiation Processing of Natural Polymers**

2. Projects for Building Infrastructure

**(7) Human Resources Development for
Nuclear Applications and Nuclear Power**

(8) Nuclear Safety Management System

**(9) Radiation Protection and Radioactive
Waste Management**

(10) Nuclear Security and Safeguards

3. Study Panel on Nuclear Power for Sustainable Development

Project on Research Reactor Network

Objective: Regional network of research/test reactor technology and isotope production & supply

- **The 4th Project Workshop: Thailand, 14-16 Oct. 2014**
- **The FNCA region will be self-sufficient in Mo-99 supply after 2018** through the increase in production capacity at ANSTO and the new production reactor operated by KAERI
- **Agenda of Project :**
 - The strategy of **stable supply of Mo-99 till 2017**
 - Sharing experience of **n-gamma technology to produce Mo-99**
 - International cooperation for **sharing multi-purpose research reactors** in the region, and sharing experiences on design of such reactors.



Workshop : Bangkok
Oct. 14-16 '14

Project on Neutron Activation Analysis

1. Monitoring sea coast marine contamination:

As, Cu are detected in soil near the factory and river sediment in Mongolia, 2014 report

2. Monitoring food contaminants:

Rice, beans, tea: no contamination

As are detected in Tilapia (BGD) 2013 report

Workshop in the Philippines, Nov. 4-6, 2014

Plan of activities in next phase (3 years):

1. Analysis of **Suspended Particle Material** (SPM) including PM-2.5 for environmental protection (Possible cooperation with RCA)
2. Analysis of **Rare Earth Element** (REE) for exploration of natural resources



Project on Mutation Breeding

Project WS in Indonesia, 4-7 March, 2014

Completed with success:

- **Disease (Banchy Top virus) resistant banana: Philippines**
- **Insect resistant orchid; Malaysia**

Focusing on Rice since 2010

New varieties: High yield with low chemical input;
New rice variety with high yield is developed in **BGD** by using ion beam irradiation in 2014



Mutant variety with early maturing and high yield (118-120-day maturing & 558-600 g seeds/m²) 12-20% yield increase BGD

Original var. *Ashal* (140-day maturing & 500 g seeds/m²) BGD

Disease Resistance in Banana (The Philippines)



Parents



**Mutant variety resistant to
Banana Bunchy Top Virus
disease**

Project on Bio-fertilizer for Yield Increase

2014: WS to be held in Malaysia Nov. 24-27

Bio-fertilizer (Rhizobium and Mycorrhiza)

- Increasing plant yields by 20-50% with the micro-organism
- **Less expensive/environmentally friendly** than chemical fertilizer

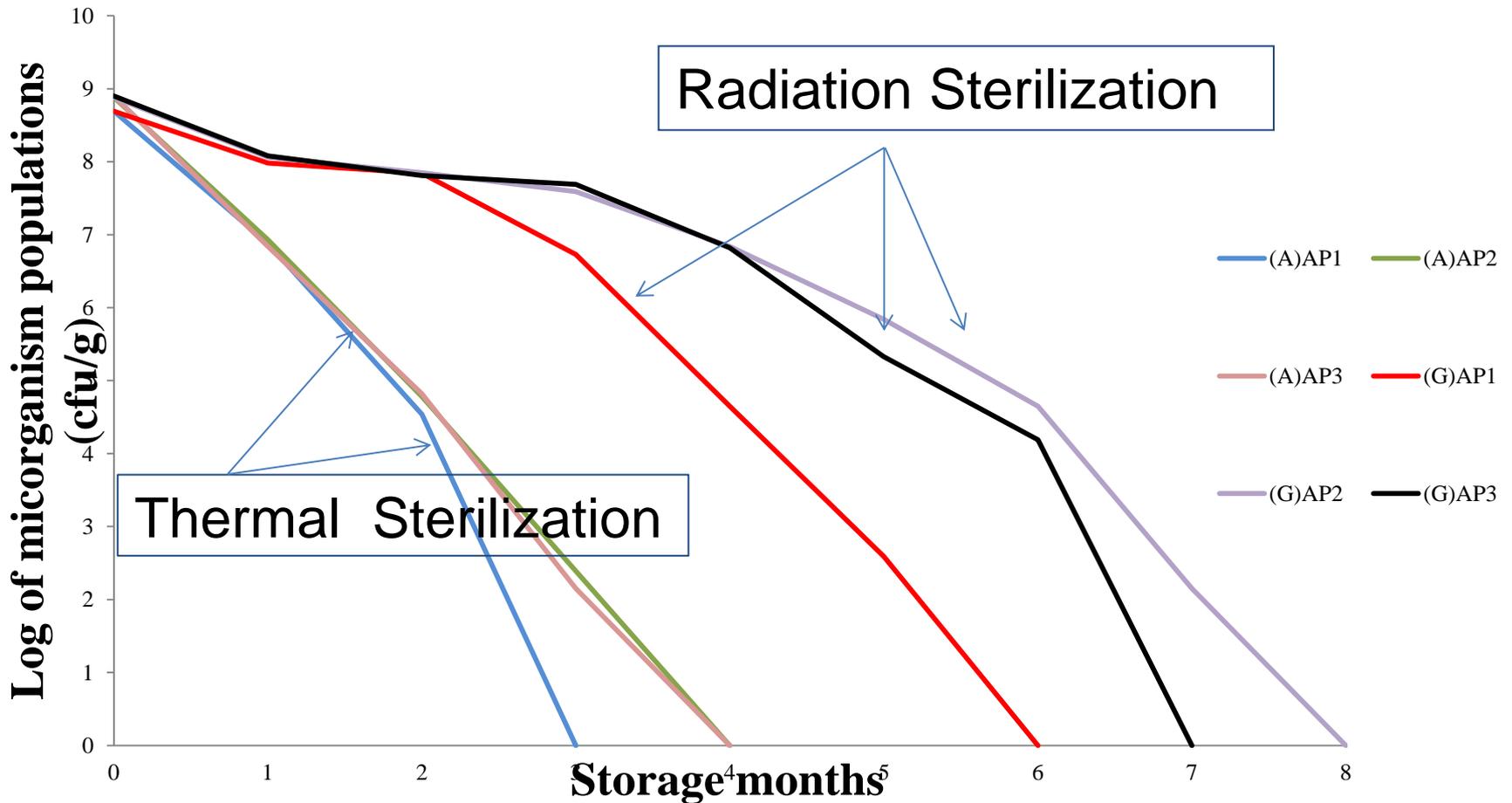


Soybeans with Rhizobium

- Carrier of bio-fertilizer is sterilized by radiation to bring better QA/QC and longer shelf-life (more than 2 times) of inoculants :
- Commercial application achieved in Malaysia, Philippines, Japan

**Plan in 2015-17: Expansion of commercial application of radiation sterilization of carrier in remaining countries:
Field test of synergy of bio-fertilizer with oligo-chitosan
PGP**

Shelf life of Biofertilizer Whose Carrier Is Sterilized by Radiation Is Much Longer Than Thermal Sterilization (Nuclear Malaysia)



FNCA WS MB, Jakarta, March 4–7,
Mar. 2014 S. Machi
S. Machi

Radiation Sterilization of Carrier for Commercial Production of Bio-fertilizer in The Philippines and Malaysia



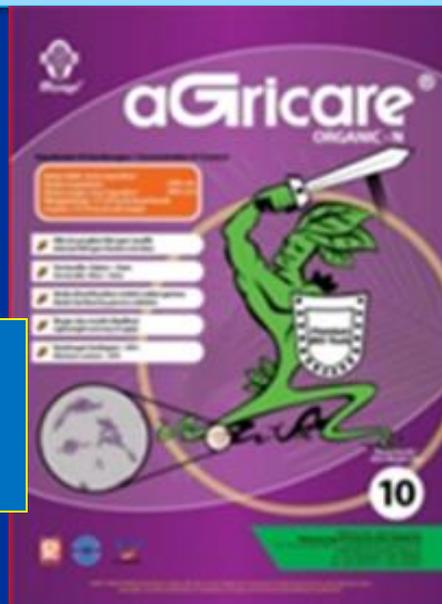
The soil + charcoal is mixed as carrier and steam sterilized for three days for 1 hour each.



From 2012, a total of 2 tons of Bio N carrier was transported to PNRI for gamma irradiation for one load.



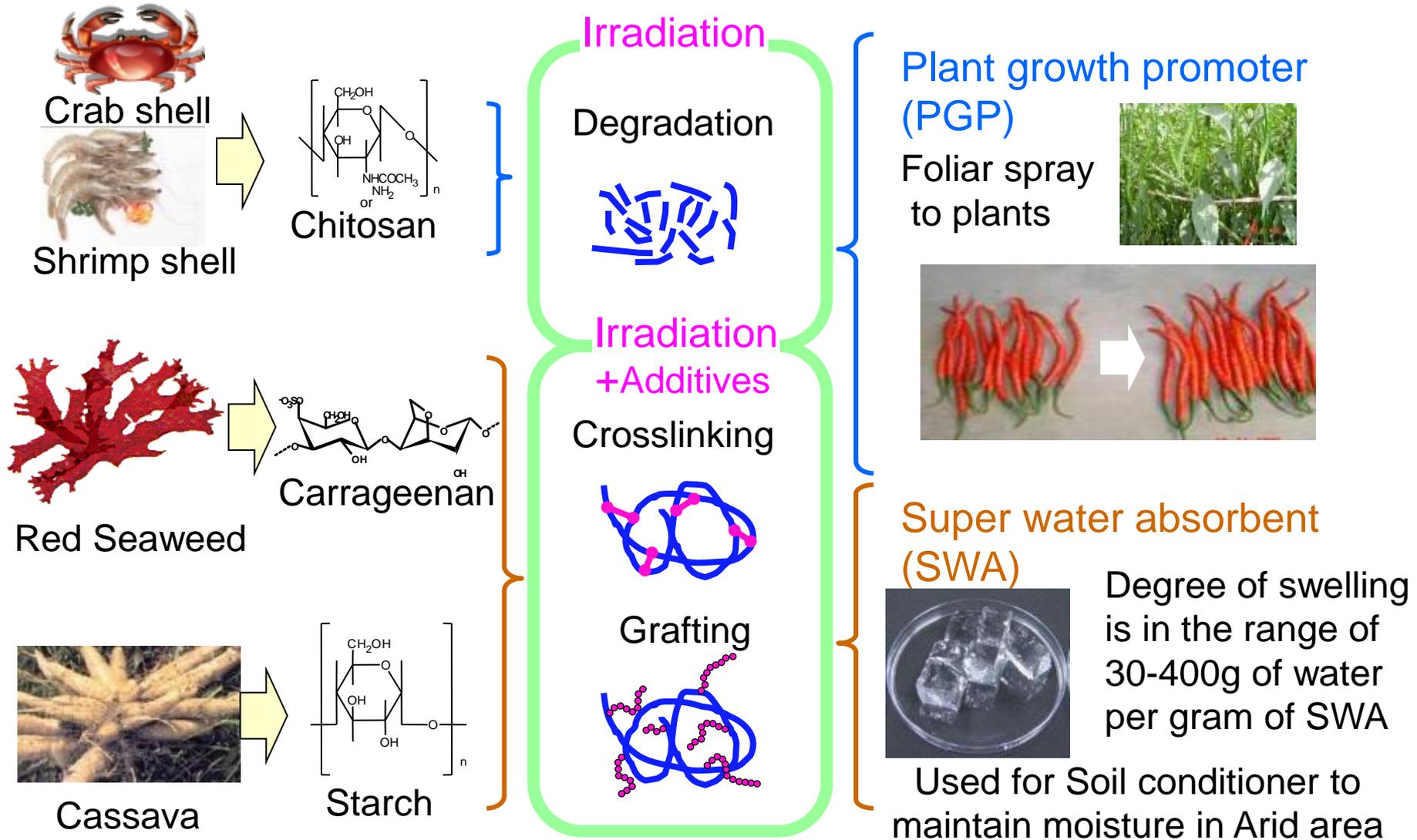
Bio N carrier to PNRI for gamma irradiation



In Malaysia, commercial “aGricare” was produced 200 t/y using irradiated carrier.

Project on Radiation Processing of Natural Polymers

Raw materials: Indigenous natural polymers



Excellent Products for Sustainable Agriculture

2015: Workshop in Indonesia, Feb. 9-12

1. Plant growth promoter (PGP)/Elicitor

Oligo-chitosan produced from waste crab/shrimp shell & oligo-carageenan by radiation processing

Yield increase by 5-50% for red chili, rice, tomato, potato, carrot; cucumber, eggplant, sorghum, rubber tree

Commercial use in Vietnam, Thailand, Japan, Malaysia

2. Super water absorbent (SWA): Soil conditioner to retain water longer used in semi-arid and arid region

Produced from AAc grafted starch by radiation

Field tests in **Vietnam and Thailand show increasing yield**

Challenge: Strengthening collaboration with agricultural sector for practical application of PGP and SWA

Remarkable Effect of Oligo-Chitosan in Field Test in JogJakarta/Indonesia for Eggplant and Rice (2014)



Eggplant



Paddy Rice

SIGNIFICANT INCREASE IN YIELD OF POTATO BY OLIGO-CHITOSAN INDONESIA (2014)



- Farmer : Mulyadi
- Location : Kayu Aro, Kerinci
- Planting date : 4 Juli 2014
- O-chitosan : 4 times



with o-chitosan 2,1 kg/
plant



Control: 0,7 kg/plant

w/ o-chitosan

control



Treated o-chitosan	2.1 kg/plant
Control	0.7 kg/plant

INCREASE 3 TIMES PRODUCTION

Oligo-chitosan Increase Rubber Latex Production (Indonesia)

- Location: Musi Rawas, south Sumatra
- O-chitosan: 50 ppm, sprayed to tree trunk once a week
- **Number of tree: 40 plants**

O-chitosan sprayed to the tree trunk



Oligo-chitosan Increase Rubber Latex Production (Indonesia)

O-chitosan sprayed to the tree trunk



- ✓ bark becomes soft
- ✓ latex is easier to be tapped
- ✓ Increase latex production
- ✓ latex sap to flow more smoothly
- ✓ Leaf more Greener
- ✓ Latex quality is better

Production of rubber latex

Treated o-chitosan	400 grams/day/plant
Control	200grams/day/plant
Pproduction increases by 2 times	

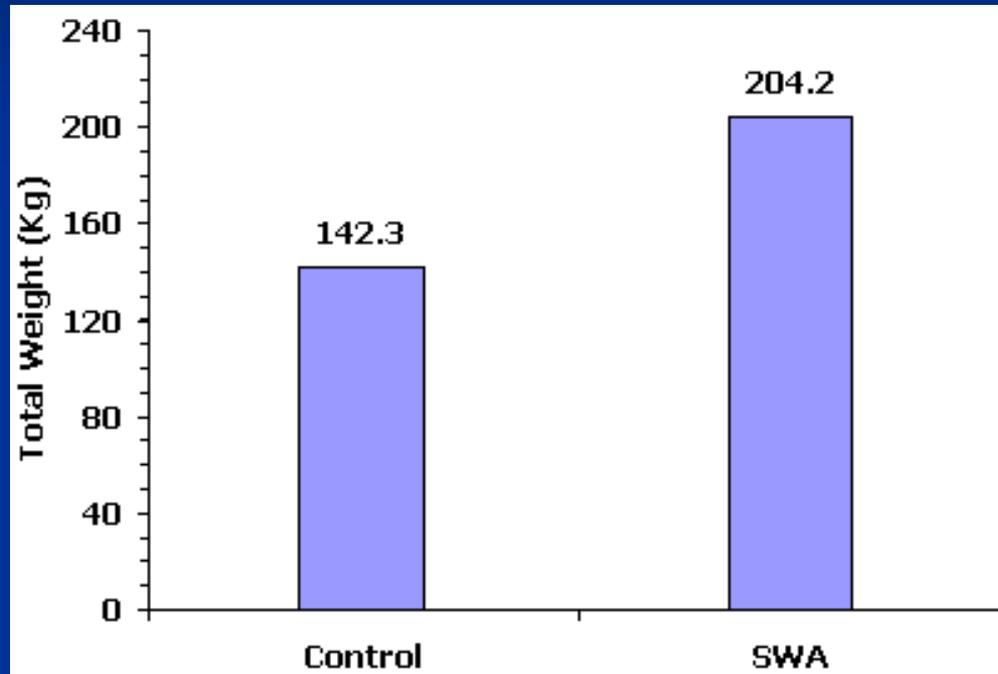


Effects of Super Water Absorbent on Baby Corn Thailand, TINT, 2013

AAc grafted starch by radiation

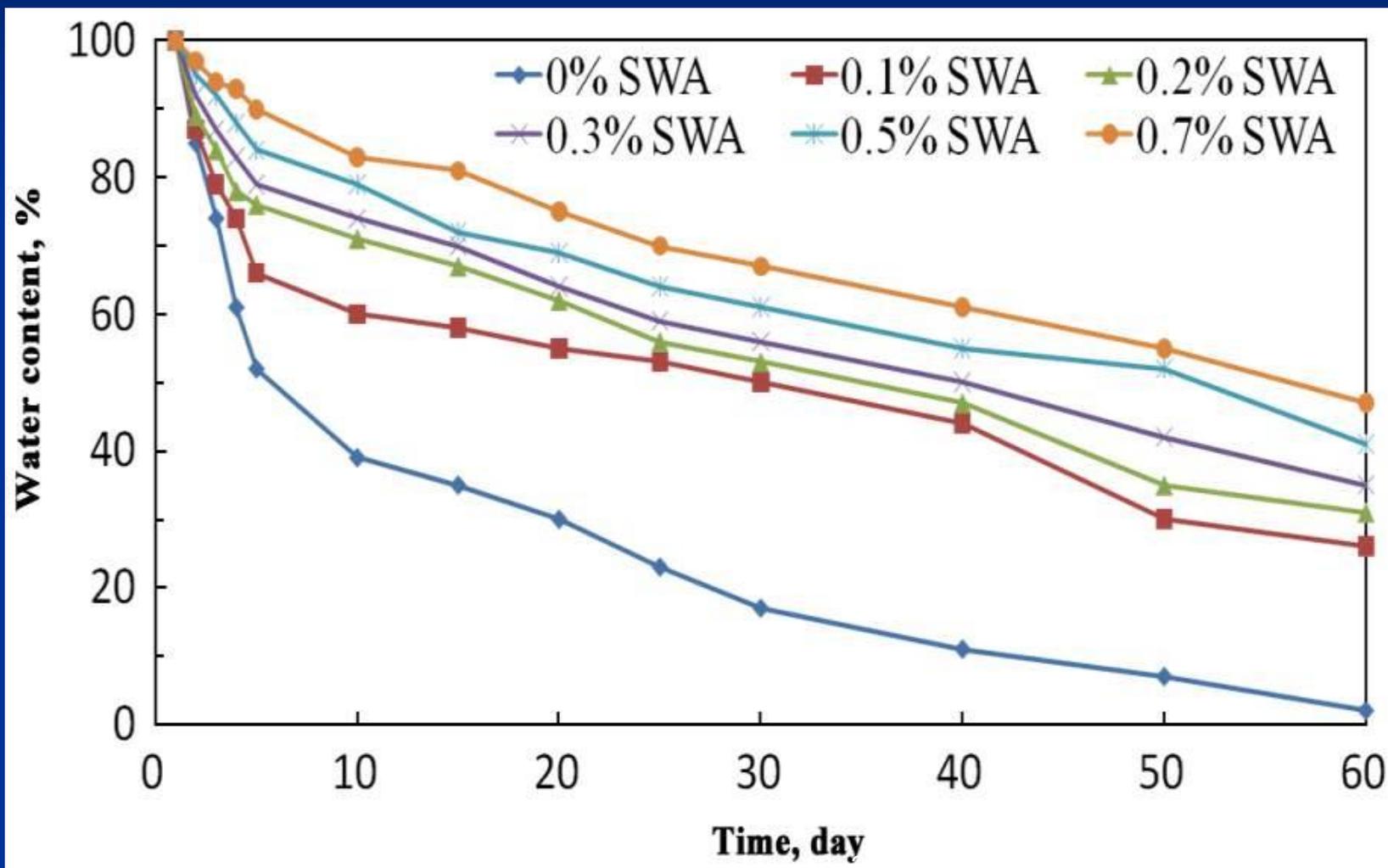
**Field test in
Kanchanaburi Province**

**-Yield increase: 43.5%-
Reduced watering.**



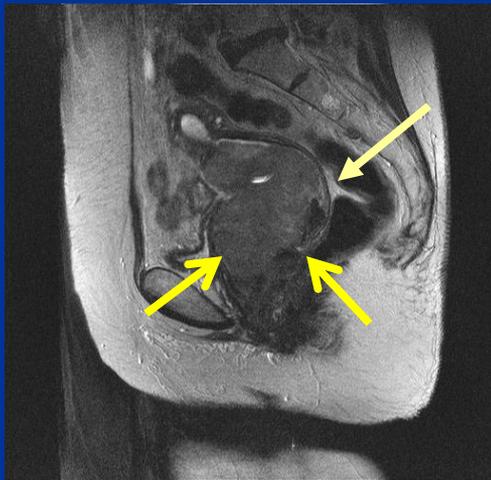
Remarkable Water Holding Capacity of Soil with SWA VINATOM, Vietnam, 2013

1 gram of the SWA absorbs 400 – 500 gram of water



Project on Protocol Study for Radiation Therapy of Cancer of Uterine Cervix, Head/neck and Breast

Advanced uterine cervix cancer treated by new protocol **Cervix IV CCRT: 5-y Survival rate 68% in 2014** (Cervix III 55% CRT)



Stage III B Before



After

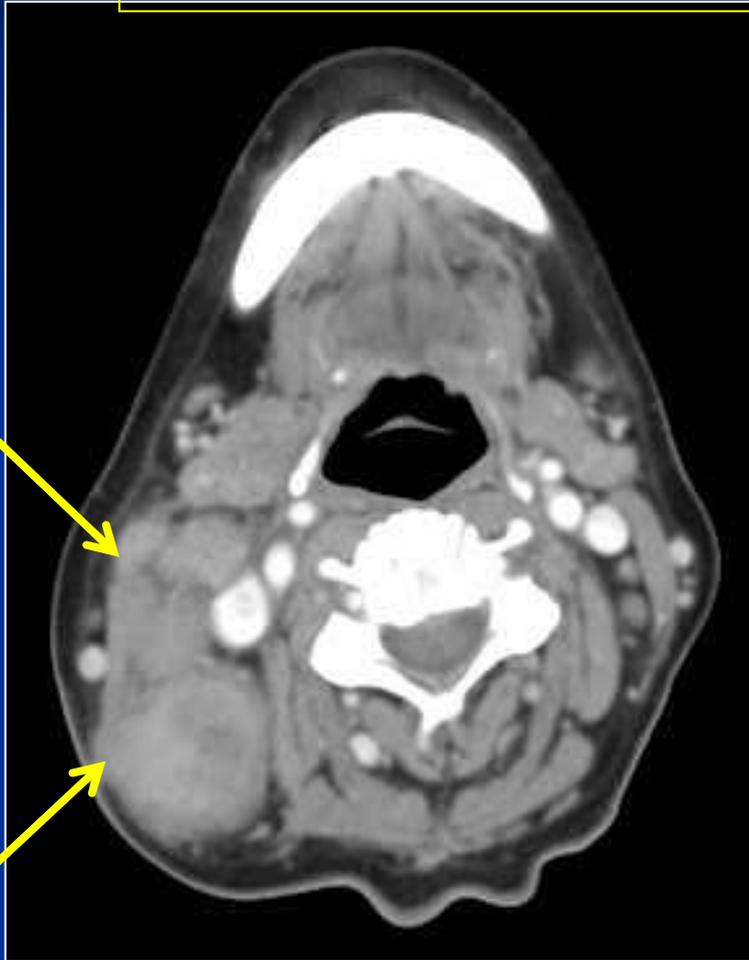
WS held in Hirosaki
Japan, Nov. 4-6, 2014

Standard Protocol in
Bangladesh, China,
Indonesia, Japan,
ROK, Malaysia,
Thailand. Vietnam

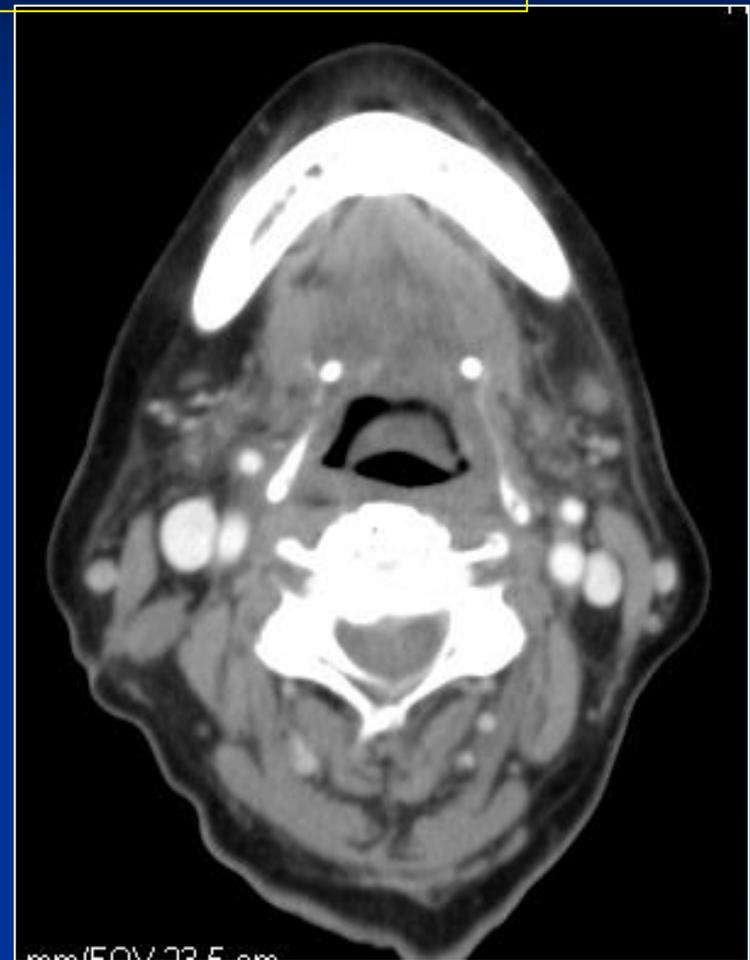
Plan in 2015: Protocol study for uterine cervix cancer, head/neck cancer, and breast cancer are to be continued

CCRT for Head/neck Cancer NPC

NPC-I Protocol: **5 year survival 81%**



T2 N3 (Stage IVB) NPC
Before treatment
Huge neck node metastases



After treatment: Complete response

Project on Safety Management System

- Self-assessment by agreed assessment tool
- Peer review by experts team identifies:

Good practices and issues for improvement

- MCs make improvement of SMS following recommendation of the peer review team

The 1st peer review: Indonesia

The 2nd peer review: Malaysia in 2011

The 3rd peer review: Korea in 2012

The 4th peer review: BOD in 2014



BAEC BDG May 19-23, 2014



KAERI ROK Oct. 2012

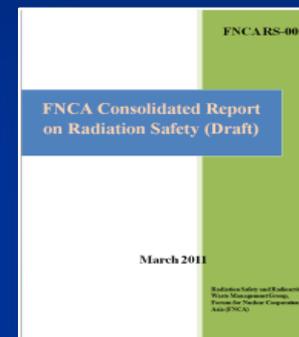
Project on Radiation Safety and Radioactive Wastes Management

Workshop & Open Seminar: Astana, Sept. 9–12, 2014

- **Sharing information and peer review of the system and facilities for radiation safety/waste management**

- Consolidated reports on status of radiation protection/safety and wastes management of member countries published in 2011

- **Consolidated Report on Nuclear/Radiological Emergency Preparedness and Response is under preparation in 2014 to be completed in 2016**



Consolidated Report '11



Workshop in Kazakhstan, Sept. 9-12, '14

Project on Nuclear Security(NS) and Safeguards(SG)

Nuclear security and Safeguards are prerequisite of increasing nuclear power program

- **SG: Enhancement of Implementation of Additional Protocol of SG agreement: Legislation and HRD**
 - **NS: Sharing experience/knowledge**
 - **HRD for nuclear security culture**
 - **Training program provided by JAEA ISCN and KINAC Korea**
- 3rd Workshop, Feb. '14, Beijing, China**
4th Workshop, Nov. '14, Daejeon, Korea



Workshop Nov. 5-7, 2014, Daejeon, Korea

Study Panel on Nuclear Power: Phase 3 Infrastructure Development

Major topics of Study Panel Meeting in 2014

- Lessons learned from Fukushima nuclear accident
- Small modular reactor (SMR)
- Roles of technical support organization (TSO)
- Stakeholder involvement for nuclear power
- Plan for 2015-17



Study P. Meeting, Aug. 26-27, 2014, Hanoi

Study Panel on Nuclear Energy (New Phase)

Scope & Objectives

1. Exchanging views and sharing experiences on the national policy and relevant technology **for nuclear energy development on specific issues in the areas of both nuclear power and nuclear application**
2. The study panel benefits Member Countries in their policy and strategy formulation, and proposing possible **international cooperation** on the issue of interests
3. The study panel may propose a **new FNCA project**

Agenda Items 1

- Policy and international cooperation for **nuclear power** for **energy security** and reduction of **carbon dioxide** emission:
- Points
 - Role of nuclear power in national **energy security** and stable supply of power
 - Role of nuclear power to **reduce GHG** emission in connection with **COP 21 in 2015** where reduction target should be submitted before COP 21 Nov.-Dec. 2015
 - **Strategy & challenges of** new comer countries for successful implementation of nuclear power program
 - **International cooperation** to enhance nuclear power program

16th FNCA Coordinators Meeting

March 4-5, 2015: Tokyo, Japan



FNCA and RCA Cooperation to Enhance Possible Synergy

- ❑ Designated Projects for the cooperation:
 - Mutation breeding
 - Radiation oncology
 - Radiation processing of natural polymers
- ❑ Reciprocal participation in RCANRM and FNCA CDM
- ❑ Challenges:
 - **Increasing participation** of non FNCA RCA countries to FNCA Project Workshops (IAEA RCA FP, LCC)
 - **Synergy** of FNCA and RCA activities is practically achieved in some member countries in R/D projects
 - FNCA Protocol of **radiotherapy** of uterine cervix cancer can be used for the RCA training course of radiotherapy
- ❑ **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 !

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Advisor to MEXT, Fellow JAEA
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