

## **Progress Report of IAEA/RCA, RAS/8109, Radiation Processing of Polymeric Materials for Agricultural Applications and Environmental Remediation**

### **Regional Activities**

In 2010, three activities of RAS/8109 were implemented as planned and shown in Table 1.0. A total of 62 participants from the 14 member countries attended the RAS/8109 activities. The regional training course and demonstration up-scaling of radiation modification of polymer for agriculture application was held from 12 to 16 July 2010 in Ho Chi Minh City, Vietnam and was attended by 13 participants. Lecturers from the region, Vietnam and Malaysia were recruited for this training course. This training course is a continuation from the regional training course on basic applications of radiation modification of polymers for agriculture which was held in Bangkok, 19-23 Oct. 2009. Radiation modification of Polymers for agriculture application is expected to be one of the important outcomes of RAS/8109.

IAEA/RCA Mid-Term Progress Review Meeting of the RAS/8109 was held in Bangi, Malaysia, 19-23 July 2010 and attended by all RAS/8109 project counterparts except China, Mongolia, Singapore and Australia. There were slight changes in the Regional Work Plan and it is given in Table 2.0.

The RCA Training Course on Technology Transfer of Radiation Processed Products to Industry: Case study has been held successfully in Manila, Philippines from 22 to 26 November 2010 and attended by 22 participants. The experience of member countries in the transfer of technology was shared amongst the participants. There is similarity in the system and mechanisms of technology transfer and commercialization in countries in the region. However, the differences are mainly in the type and quantum of funding provided by the government for commercialization. In this training course 4 lecturers from the region, 2 from Philippines, 1 from India and 1 from Malaysia were recruited.

Table 3.0 shows the OUTPUTS of RAS/8109 based on the activities carried out in 2010.

### **Project Progress and Achievement**

The progress of project implementation in most of the member countries are in accordance to their national work plans. However, it seems that some adjustments have been made to their project activities taking into account the earlier experimental results, peers group advice and the new selection of agriculture crops of priority to the country.

Table 4.0 shows the summary of the progress and achievement of project implementation in each member country in 2009 - 2010 based on the reports submitted and the expected outcomes of RAS/8109.

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Table 1.0 No of participants from member countries attended the RAS/8109 activities in 2010.

	BGD	CHI	IND	INS	JPN	KOR	MAL	MO N	MYN	PAK	PH I	SL K	TH I	VE T
IAEA/RCA Training Course and Demonstration Up-scaling of Radiation Modification of Polymer for Agriculture Applications, 12-16 July 2010, Ho Chi Minh City, Vietnam.	-	1	-	2	-	-	2	-	1	2	2	2	2	6
IAEA/RCA Mid-term Progress Review Meeting of the RCA Project on Supporting Radiation Processing of Polymeric Materials for Agricultural Applications and Environmental Remediation, 19-23 July 2010, Bangi, Malaysia.	1	-	1	1	1	1	2 + 8	-	1	1	1	1	1	1
IAEA/RCA Training Course on Technology Transfer of Radiation Processed Products to Industry: Case study, 22-26 November 2010, Manila, the Philippines.	1	-	1	2	-	1	2	-	2	2	1 + 4	2	2	1
SUB TOTAL	2	1	2	5	1	2	14	-	4	5	8	5	5	8
TOTAL	62 PARTICIPANTS													

Table 2.0. Revised Regional Work Plan for 2011 adopted during the Mid-Term Review Meeting in Malaysia.  
19 – 23 July 2010.

Activity	Date	Venue	Status
1. RCA Training Courses on Basic Radiation Processing of Polymer and Recycling of Polymeric Waste by Using Radiation Technology.	23 – 27 May 2011	Korea	Confirm and in progress
2. RCA Training Course on advanced applications of radiation processing for recycling of polymeric waste.	04 – 08 July 2011	Malaysia	Confirm
3. Regional Training Course and Demonstration on Up-scaling of Radiation Modification of Polymer for Agriculture Applications: Plant growth promoter and plant elicitor. - China	11 – 15 Sept 2011	China	Waiting for confirmation
4. Regional Executive Management Meeting for Policy Makers and End Users on Super water absorbent, toxic metal absorbent and plant growth promoter for agriculture applications.	03 – 07 Oct 2011	Japan	Waiting for confirmation
5. Final Progress Review Meeting	14 – 18 Nov 2011	Indonesia	Waiting for confirmation
6. Regional Executive Management seminar for Policy Makers and End Users: Recycling of Polymeric Waste using radiation technology	-	-	Drop from the Work Plan

Table 3.0 Activities of RAS/8109 as OUTPUTS for 2009 - 2010.

OUTPUTS	Performance Indicators 2009	Performance Indicators 2010
<p>1. Project management structure - Project Team, National Work Plan, Project Planning, Monitoring and Evaluation</p>	<p>Documented national and regional work plan .</p> <ul style="list-style-type: none"> <li>• Regional work plan has been approved and adopted at the RCA RAS8019 Project Coordination Meeting in Korea, 16-20 Mac 2009.</li> <li>• 12 out of 13 Member States have submitted the National Work Plans and established Project Teams by June/July 2009</li> </ul>	<ul style="list-style-type: none"> <li>• 12 countries submitted 3<sup>rd</sup> Progress reports of RAS/8/109 for Jan – June 2010.</li> <li>• 12 countries submitted 4<sup>th</sup> Progress reports of RAS/8/109 for July – Dec 2010.</li> <li>• Myanmar participated in the activity of RAS/8/109 but has never submitted progress reports.</li> <li>• Other member countries, Australia, Mongolia and Singapore are not participating in RAS/8/109.</li> <li>• IAEA/RCA Mid-term Progress Review Meeting of the RCA Project on Supporting Radiation Processing of Polymeric Materials for Agricultural Applications and Environmental Remediation, 19-23 July 2010, Bangi, Malaysia – attended by 11 project counterparts except CHINA.</li> </ul>
<p>2. Trained personnel on basic applications of radiation technology for super water</p>	<p>No. of participants and level of understanding through assignment :</p> <p>i. IAEA/RCA Regional Training Course</p>	<p>No. of participants and level of understanding through assignment :</p> <p>i. IAEA/RCA Training Course and</p>

<p>absorbent, toxic metal absorbent or plant growth promoters for agriculture production.</p>	<p>on Basic Applications of Radiation Modification of Polymers for Agriculture, Bangkok, Thailand, 19-23 October 2009 – <b>21 participants.</b></p> <p>ii. Regional Training Course on Quality Control and Quality Assurances of Radiation Facility Operation and Dosimetry, December 7-11, 2009, Vadodara, India – <b>18 participants.</b></p>	<p>Demonstration Up-scaling of Radiation Modification of Polymer for Agriculture Applications, 12-16 July 2010, Ho Chi Minh City – <b>20 participants.</b></p> <p>ii. IAEA/RCA Training Course on Technology Transfer of Radiation Processed Products to Industry: Case study, 22-26 November 2010, Manila, the Philippines - <b>21 participants.</b></p> <p>iii. Expert mission from Vietnam to Indonesia, 24 Oct – 06 Nov 2010 on SWA and participated in National Seminar.</p>
<p>3 Training module and demonstration materials</p>	<p>Compilation and documentation on training modules and demonstration resources – Collection of lectures notes in the power points presentation formed in CD.</p>	<p>Compilation and documentation on training modules and demonstration resources – Collection of lectures notes in the form of power points presentation.</p>

Table 4.0 Progress and achievement of RAS/8109 Project Implementation in 2010 and in accordance to the expected OUTCOMES

COUNTRY/ OUTCOME	PROGRESS AND ACHIEVEMENT FOR 2010				
	OUTCOME 1 Super water absorbent (SWA), toxic metal absorbent and plant growth promoter (PGP) /elicitor for agriculture applications.	OUTCOME 2 Operational Procedure for the effective utilization of super water absorbent, toxic metal absorbent and plant growth promoter/elicitor to enhance agricultural production.	OUTCOME 3 Operational Pilot scale production of super water absorbent and of plant growth promoter/elicitor.	OUTCOME 4 Active Collaboration with industry on recycling of industrial polymeric waste using radiation technology.	OUTCOME 5 Sustainable transfer of technology related to the radiation processed products.
BGD	<ol style="list-style-type: none"> <li>1. Oligochitosan as PGP for maze at lab scale</li> <li>2. SWA at lab scale</li> </ol>	<ol style="list-style-type: none"> <li>1. Protocol for application of oligochitosan for rice</li> </ol>	<ol style="list-style-type: none"> <li>1. Field trial using oligochitosan as PGP for rice</li> </ol>	-	-
CHINA	<ol style="list-style-type: none"> <li>1. Oligochitosan for aquaculture and agriculture</li> <li>2. Radiation Modified Polysaccharides hydrogel for Toxic Metal absorbent</li> </ol>	<ol style="list-style-type: none"> <li>1. Procedure for utilization of oligochitosan for aquaculture and agriculture</li> </ol>	<ol style="list-style-type: none"> <li>1. Field trial oligochitosan for aquaculture completed</li> <li>2. Field trial modified hydrogel for toxic absorbent for wastewater treatment.</li> </ol>	-	<ol style="list-style-type: none"> <li>1. Technology transfer to PKU Tobefar Co. LTD on application oligochitosan for aquaculture and agriculture</li> </ol>
INDIA	<ol style="list-style-type: none"> <li>1. SWA based on CMS</li> <li>2. SWA based on carragenan</li> <li>3. Oligochitosan as PGP</li> <li>4. Oligoalginate as PGP</li> </ol>	<ol style="list-style-type: none"> <li>1. Protocol on the applications of SWA</li> <li>2. Protocol for applications of Oligochitosan, Oligoalginates for agriculture.</li> </ol>	<ol style="list-style-type: none"> <li>1. Field trail on SWA for wheat crops</li> <li>2. Field trial on Oligochitosan and Oligoalginate for lemongrass and mentha</li> </ol>	-	<ol style="list-style-type: none"> <li>1. Direct technology transfer to farmers on SWA and PGP.</li> </ol>

	5. Toxic metal absorbent based on chitosan				
INDONESIA	1. Oligochitosan as PGP 2. SWA based on Indonesian cassava	1. Protocol applications of Oligochitosan for soybean 2. Methodology preparation of SWA at lab scale	1. 60L oligochitosan/month 2. Field trial of PGP for soybean	-	1. Direct transfer of technology on the application of PGP (FITOSAN) to farmers. 2. FITOSAN USD7.0/L
JAPAN	1. Toxic metal absorbent 2. SWA based on Hydroxypropyl cellulose (HPC) and poly(vinyl alcohol) (PVA) 3. Crosslinked PVA gel membrane as metal indicator	1. Protocol for emulsion grafting of membrane for toxic metal absorbent	1. Pilot scale toxic metal absorbent completed.	-	1. Technology transfer of emulsion grafted membrane for Ultra Pure Water Filter (UPF) to local company.
MALAYSIA	1. Oligochitosan as PGP	1. Protocol for production of 2000 L oligochitosan 2. Protocol for application of oligochitosan for rice	1. Pilot scale production of oligochitosan, 2000L per cycle.	1. Pilot scale trial on processing and utilization of Waste Tyre Dust (WTD) Polymeric compounds for shoe sole in collaboration with local company completed.	1. Technology transfer of oligochitosan as PGP for rice with Paddy Plantation Company, FELCRA (M) Berhad – in negotiation.
PAKISTAN	1. Low MW Chitosan and Medium MW Chitosan as post harvest fruit preservative	1. Preparation of LMWC and MMWC at lab scale. 2. Methodology for application of irradiated Chitosan for fruit	-	1. Degradation of brominated flame retardant compounds at lab scale 2. Biodegradable PE using chitosan at lab	-

		preservation.		scale	
PHILIPPINE S	<ol style="list-style-type: none"> <li>1. Radiation modified k-carrageenan as PGP at lab scale.</li> <li>2. Oligochitosan at lab scale</li> </ol>	<ol style="list-style-type: none"> <li>1. Methodology for utilization of irradiated k-carrageenan as PGP</li> <li>2. Optimization methodology for production of oligochitosan as PGP at lab scale</li> </ol>	-	-	-
REPUBLIC OF KOREA	-	-	-	1. Advanced pulping process using electron beam irradiation (reduce waste)	-
SRI LANKA	1. Oligochitosan as PGP and fungicides	<ol style="list-style-type: none"> <li>1. Methodology to produce oligochitosan at lab scale</li> <li>2. Protocol to use oligochitosan for papaya, pineapples, rice, rambutan, okra and tomato.</li> </ol>	-	-	-
THAILAND	<ol style="list-style-type: none"> <li>1. Oligochitosan for PGP at lab scale</li> <li>2. SWA from cassava at lab scale</li> </ol>	<ol style="list-style-type: none"> <li>1. Application of Oligochitosan for chilli and rice – field trials</li> <li>2. Application of SWA for corn seeds</li> </ol>	-	-	Direct technology transfer to farmers on production and application of oligochitosan as PGP.
VIETNAM	1. Carboxymethyl starch/polyvinyl pyrrolidone nanogel	1. Application of CMS/PVP for rice, vegetables and dragon	1. Pilot plant for production SWA	-	



	used as PGP 2. SWA acrylic acid grafted cassava starch	fruits 2. Application SWA as soil conditioner			
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