

# **REPORT OF THE REGIONAL TRAINING WORKSHOP ON BIOLOGICAL CONTROL**

**25 February – 2 March 2013  
Bangkok, Thailand**

## **SUMMARY**

The Asia Pacific Plant Protection Commission (APPPC) in collaboration with the Government of Thailand organized a Regional Training Workshop on Biological Control from 25 February-2 March 2013 in Bangkok, Thailand, with participation of delegates from 10 countries. The workshop was organized in line with the work plan of APPPC Standing Committee on IPM for enhancement of regional collaboration on biological control matters. It not only provided the participants with updated information and Thailand's practical experience in BC, but also provided an opportunity to review concepts and principles of BC, share experiences among each participating country as well as to discuss opportunities and challenges for production and sustainable application of BCA in the context of IPM strategies. Meanwhile participants discussed best options for better access and application of BC by IPM farmers, which includes the techniques on mass rearing in the laboratory and releases under field conditions with follow-up field monitoring and evaluation of their effectiveness as well as development of the training capacity among IPM facilitators in identifying specific BCA (parasitoids, predators and microbial) for management of specific pests. It is expected that the regional network of information exchange and collaboration for promotion of biological control be established by inclusion of all participants who may start to provide update development, issues and challenges to the APPPC website.

## **1. INTRODUCTION**

One of the most important elements of any robust IPM strategy is making optimal use of biological control (BC), which is the use of natural enemies to regulate pest populations to a level where these will not cause yield loss. The value for more optimal use of BC is recognized at national and international levels. However, in many places the technical knowledge and skills with regard to production and sustainable utilization of BC options are still inadequate. A need has been identified by representatives of member countries of the Asia and Pacific Plant Protection Commission - Standing Committee on IPM to organize a training workshop for field staff to share the experience in BC among participating countries and promote regional collaboration in BC. Thailand, as one of pioneer countries with long-standing expertise in the development and application of BC in IPM practice in the region, kindly agreed to play a leading role in facilitation of the training workshop on BC.

The regional training workshop on biological control was organized from 25 February to 2 March 2013 in Bangkok, Thailand by the APPPC Standing Committee on IPM in collaboration with the Department of Agriculture Extension (DOAE), the Department of Agriculture (DOA), Department of Rice (DOR), and National Bureau of Agricultural Community and Food Standard (NBACFS), Ministry of Agricultural and Cooperatives, Thailand. Participants consisted of ten (10) countries namely Bangladesh, Cambodia, China, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Philippines, Thailand and Vietnam. The workshop was facilitated by the Biological Control Group, Pesticide Management Division,

DOAE in collaboration with the cited Thai agencies. Experts from DOA, DOAE, NBACFS, universities, institutes and private sectors in Thailand kindly provided lectures related to the meeting subject .

The objectives of the training were to provide participants with updated information and training course on the BC with practical experience of Thailand to assist participants in the enhancement of sustainable development of BC in their own countries. In particular, the training was planned to share experiences and discuss opportunities and challenges for quality production and sustainable utilization of biological control agents (BCA), and to identify better options of easy access and adoption by IPM farmers.

The participants will:

- Have better understanding of the concepts and principles of effective BC programmes;
- Be able to identify best bet options for development, production and utilization of BC options for field practice by farmers;
- Understand the importance of quality control and marketing biocontrol agents as well as extension;
- Understand role of public and private sectors as well as producers' organizations for the development of BC;
- Become familiar with the available technical resources and development of a network of collaboration;
- Be aware of the International Standards for Phytosanitary Measures especially with regard to the importation and release of BCA;
- Plan for best bet options for further promotion of BC in their home countries.

## **2. OPENING CEREMONY**

Mr. Withaya Athipanawan, Deputy Director-General, Department of Agricultural Extension, Thailand gave the opening remarks by welcoming the participants to the workshop. He noted that apparently the improper use of pesticides not only causes health problems for farmers and consumers, but also environmental concerns such as water and soil contamination. Moreover, pests can develop a resistance to pesticides leading to need of a greater dose of the pesticides or application of new ones. Biological control is one of the effective methods that can help decrease the use of pesticides. He further stated that production and sustainable utilization of biological control options require specific technical knowledge and skills. One of the main objectives in organizing this training workshop was to provide the participants with updated information and experience of Thailand, as one of pioneer countries with long-standing expertise, in biological control. In addition, the workshop also provided good opportunities for participants to share their technical know-how and experience, and to strengthen the cooperation between member countries.

Mr. Withaya concluded his address by wishing participants a fruitful meeting and he looked forward to sustainable development of biological control in their respective countries.

Dr. Yongfan Piao, Senior Plant Protection Officer, FAO Regional Office for Asia and Pacific welcomed participants and highlighted development of the regional biological control in the context of IPM.

### **3. COUNTRY REPORTS ON BIOLOGICAL CONTROL**

Each country participant presented brief introduction of national status of biological control. It was noted that biological control has become an important part of practice of IPM in participating countries with diverse progress made at certain areas, i.e. specific target pest and crops based on local facilities.

Biological control agents has been widely produced both in the laboratory and farmer groups and the agents have been widely applied in the field of horticultural, food and estate crop in many countries. It was noted that policy support or commitment has been provided for the development. In Philippines, The Republic Act no. 10068 the Organic Agriculture of the Philippines was created in promulgated in 2010. This is an act providing for the development and promotion of organic agriculture in the Philippines and for other purposes. Declaration of Policy under the organic act will cumulatively condition and enrich the fertility of the soil, increase farm productivity, reduce pollution and destruction of the environment, prevent the depletion of natural resources, further protect the health of farmers, consumers, and the general public, and save on imported farm inputs. As one of follow up actions, a national biological control forum was conducted in October 2012 wherein a national road map for crop protection under the Department of Agriculture was presented by the National IPM Coordinator. The road map was towards Attaining Food Security thru Farmer-led Crop Bio-Security, one of thrusts is “Development of Ecological-based, Environmental-Friendly Crop Protection Technologies and Mechanisms”.

A number of successful classical biocontrol practices, which were funded and coordinated by FAO, were observed, such as biocontrol of newly introduced and spread coconut beetle-brontispa in Thailand, Vietnam, Laos and Cambodia as well as biocontrol of cassava pink mealy bug in GMS countries in recent years.

It was noted that main pillar of sustainable rice intensification is conservation and sustainable use of ecosystem services provided by natural biological control.

### **4. LECTURES OF BIOLOGICAL CONTROL**

A number of lectures on biological control were provided to the participants together with several field/lab practical sessions. The lectures covered 5 areas:

- Introduction to biological control in Thailand
- General information
- Knowledge and technology of biological control
- Knowledge and technology of non chemical control
- Extension activities

The main context of lectures made by experts are as follows:

- *Dr. Banpot Napompeth : Introduction to Biological Control*

- Introduction of biological control
- Milestones of biological control in Thailand
- Thailand as a source for biological control agents
- International & regional development of biological control

- *Mr. Jan Willem Ketelaar: General information*

- Biological control : Latest innovations in application by smallholder farmers in Asia

- *Dr. Amporn Winotai : Knowledge and technology of biological control*

- Insect natural enemies : classification, biology, behaviour
- Biological control of leaf miner
- Biological control of coconut hispine beetle, *Brontispalongissima*
- Introduction of natural enemies

-*Ms. Lawan Jeerapong : Extension activities*

- Thailand extension experience on BC
- Field survey of insect pests and natural enemies
- Practice on insects and natural enemies classification
- Farmer promotion on production of some important predators and parasites

-*Dr. Tipvadee Attathom : Microbial control of insects*

- Entomopathogens for insect pest control
- Microbial production and application
- Biotechnology for biopesticide development

- *Dr. Chiradej Chamswang*

- Microbial control of plant diseases by using *Trichoderma* and *Bacillus* Bioproducts

-*Ms. Tassanee Pradyabamrung*

- ISPM for import and release of exotic BCA

-*Dr. Supakit Maketon*

- Production, marketing experience and trend in BCA business

-*Ms. Areepan Upanisakom*

- Farmer promotion on production of some important, insect predators and parasitoids

-*Mr. Sopon Uraichuen*

- Biology, ecology and classification of insect pests of some economic crops

-*Mr. Vorachai Manomuth*

- Insect pheromone promoted in Thailand for sustainable crop production

-*Ms. Suksom Chinvinijkul*

- Control of insect using radiation

## **5. FIELD SURVEY OF INSECT PESTS AND NATURAL ENEMIES**

Participants visited Damneausaduan district in Rat Buri province for the surveillance practical exercise. The survey on the pest and natural enemies was conducted in the mixed plantation of papaya and citrus trees. As a result, scale insect of papaya, papaya ring spot virus and anthracnose of papaya, *Helocoverpa armigera* on citrus, and some small insect

parasite in order Hymenoptera (scale insect parasite) were found; At the field of pakchoi *Spodoptera exiqua* and flea beetle were found. During the survey on the field of asparagus, participants found only stem blight of asparagus but they had an opportunity to observe the facility of collection, size grading and schedule for production of GAP asparagus.

## **6. DEVELOPMENT OF TRAINING MODEL ON BIOCONTROL AGENTS**

At the end of the training session, there was a group discussion on development of training model for promotion of biological control. As the modality of the training could be diverse country by country and case by case, there is need for the discussion to focus on key elements to be considered in various trainings at different levels by countries. The output of the discussion on the key elements is as follows:

### National level

- ▶ Organize national level trainings on key officials related to plant protection
- ▶ Policy support and budget allocation
- ▶ Cooperation with other stakeholder
- ▶ Appreciation for good application of BCA to farmers

### Provincial/ Regional Level

- ▶ Prepare and implement action plan following the national level
- ▶ Surveillances about insect and disease
- ▶ Conduct experiment/field demonstration on BCA
- ▶ Prepare the pure culture on BCA to farmers
- ▶ Evaluation report send to NL
- ▶ Research new host on BCA
- ▶ Training farmers on BCA

### Farmer Level

- ▶ Facilitate farmer aware of BCA
- ▶ Participatory field application of BCA
- ▶ Make demonstrations in the field
- ▶ transmit the knowledge on BCA to other farmers.

### Regional Cooperation on BCA

- ▶ Continual support by FAO and APPPC
- ▶ Facilitate cooperation among countries in relation to exchanging experience in BCA
- ▶ Organize workshop/ seminar and symposium
- ▶ Facilitate sharing experts among countries
- ▶ Implement project between country to country
- ▶ Promote information exchange by email or using other modern technology
- ▶ Each country need to nominate the focal point for communication
- ▶ Some research cooperation

## **7. CONCLUSIONS AND RECOMMENDATIONS**

The training workshop was considered to be very useful and informative. Participants had better understanding of the concepts and principles of effective BC programmes, best bet options for development, production and utilization of BC options for field practice by farmers, the importance of quality control and marketing biocontrol agents as well as extension, role of public and private sectors as well as producers' organizations for the development of BC as well as the awareness of the International Standards for Phytosanitary Measures concerned with regards to the importation and release of BCA.

Participants recognized invaluable experience of Thailand in promotion of biological control in the country. Institutionalized sustainable enhancement of biological control in Thailand was very impressive. Such enhancements are being extensively backstopped by DOA, DOAE, universities, research institutes and private collaborators. It was observed that frontline research on new pest and new natural enemies provided fundamental basis for follow up prompt intervention to the field management for dealing with outbreaks of new pest together with community participatory approaches. Participants benefited from lessons and experiences shared at the training workshop not only to improve the knowledge concerned but also to develop ideas of promoting sustainable development of biocontrol in own countries.

The Workshop recommended:

- All participants should act as trainers when they return to their home countries. They are expected to deliver knowledge, information, expertise that they gained from the workshop to their colleagues, counterparts, farmers and other associates.
- It was stressed that all participants should be part of the Regional Biological Control Network in order to share expertise and information among themselves.
- It was also emphasized that participants should provide an update on biological control and progress through the APPPC website.
- Explore opportunity for more training workshops with inclusion of hands-on practice.

The training workshop ended after issuing the certificate to each participant and closing remarks made by Mr. Withaya Athipanawan, Deputy Director-General, Department of Agricultural Extension, Thailand and Dr. Yongfan Piao, Executive Secretary of APPPC.

## Appendix I

### List of Participants

	Country	Name	Title	Organization	contacts
1	<b>Bangladesh</b>	Mr. Anwarul Hoque	Additional Director	Plant Protection Wing Department of Agricultural Extension, Dhaka, Bangladesh	Email: <a href="mailto:ullah61@yahoo.com">ullah61@yahoo.com</a> ; <a href="mailto:dppw@dae.gov.bd">dppw@dae.gov.bd</a>
2	<b>Cambodia</b>	Ms. Srun Khema	National IPM Programme	Ministry of Agriculture, Forestry and Fisheries (MAFF)	# 54 B / 49 F, St 395-656, Sangkat Toeuk Laak III Khan Phnom Penh, Phnom Penh, Cambodia Tel: (855-17) 337 338 Email: <a href="mailto:faipm.natstaff@online.com.kh">faipm.natstaff@online.com.kh</a>
3	<b>China</b>	Mr. Dong Jie	Plant Protection Officer	Beijing Plant Protection Station	No. 9 Beisanhuan Middle Road Xicheng District Beijing 100029 China Tel: 8610-82078489, 13810662126 Fax: 8610-62016348 Email: <a href="mailto:dongjiefine@126.com">dongjiefine@126.com</a>
		Ms. Li Yongmei	Senior Agronomist	Plant Protection and Quarantine Station of General Station of Plant Protection of	No. 9 Beisanhuan Middle Road Xicheng District Beijing 100029 China Tel: 8610-82078489, 13810662126 Fax: 8610-62016348 Email: <a href="mailto:dongjiefine@126.com">dongjiefine@126.com</a>
		Mr. Xie Yiling	Senior Agronomist	Guangxi Zhuang Autonomous Region	Plant Protection and Quarantine Station of Yunnan province China No. 38018 Xinzhu Road, Nanning City, Guangxi China Tel : 867 715868 258 Email: <a href="mailto:xieyiling001@126.com">xieyiling001@126.com</a>
4	<b>Indonesia</b>	Mrs. Desmawati	Plant Pest Control Officer	Directorate of Horticulture Protection Directorate	Mob: 081 3199 21003 Email: <a href="mailto:desmawatis@yahoo.com">desmawatis@yahoo.com</a>

				General of Horticulture Production Ministry of Agriculture	
5	<b>Lao PDR</b>	Mr. Phoukaothong Sykaisone	Head of IPM Unit	Plant Protection Center Department of Agriculture, MAF Vientiane, Lao PDR	Tel: +85621 812164 Mobile: +85620 22202699 Email: <a href="mailto:sphoukaothong@yahoo.com">sphoukaothong@yahoo.com</a>
6	<b>Malaysia</b>	Mr. Mohd Sanusi bin Mohd Kasim	Crop Protection and Plant Quarantine officer	Crop Protection and Plant Quarantine Division, Department of Agriculture Malaysia	JLN Gallagher, 60480 Kuala Lumpur Malaysia Tel: 6012 656 5246 Email <a href="mailto:sanusikasim@gmail.com">sanusikasim@gmail.com</a>
7	<b>Myanmar</b>	Ms. Nay Nay Oo	Senior Research Assistant	Department of Agriculture Research Ministry of Agriculture and Irrigation Myanmar	Email: <a href="mailto:ppmas.moai@mptmail.net.mm">ppmas.moai@mptmail.net.mm</a> ; <a href="mailto:naynayoo5062@gmail.com">naynayoo5062@gmail.com</a>
8	<b>Nepal</b>	Dr. Yubak Dhoj G.C.	Program Director, Plant Protection Directorate & Co-ordinator, National IPM Program (Joint Secretary) Directorate of Plant Protection	Department of Agriculture Ministry of Agriculture Development Kathmandu, Nepal	Cell: ++ 977 98511 28 129
9	<b>Philippines</b>	Ms Fe B. Pableo	Senior Agriculturist	Bureau of Plant Industry (BPI) Davao National Crop Research and Development Centre (DNCRDC) Department of Agriculture	692 San Andres Street Malate Manila, Philippines Mobile #: +632928-5204143 Email: <a href="mailto:ping_b_pableo@yahoo.com">ping_b_pableo@yahoo.com</a>
10	<b>Thailand</b>	Ms. Rawadee Promkerd	Senior Subject Matter Specialist	Biological Control Group, Pest Management Division Department of	Email: <a href="mailto:Kate_7459@hotmail.com">Kate_7459@hotmail.com</a>



				Agricultural Extension	
11	<b>Vietnam</b>	Mr. Nguyen Tuan Loc		Fourth Regional Center for Plant Protection - Plant Protection Department (PPD), MARD	28 Tran Phu Vinh city, Nghe An Mob: 84-947161369 Fax: 84-38-3843790 Email: <a href="mailto:nguyentuanloc_2006@yahoo.com">nguyentuanloc_2006@yahoo.com</a>
Observers					
1	Thailand	Ms. Tasanee Pradyabumrung	Senior Standards Officer	National Bureau of Agricultural Commodity and Food Standards (ACFS) Ministry of Agriculture and Cooperatives	50 Phahonyotin Rd., Chatuchak, Bangkok 10900 Tel: 662 561 2277 Fax: 662 561 3357 Email: <a href="mailto:tasanee@acfs.go.th">tasanee@acfs.go.th</a>
2		Mr. Vichan Watthanakaiwan	Research Zoologist	Plant Protection Research and Development Office Department of Agriculture Ministry of Agriculture and Cooperatives	Email: <a href="mailto:w.vichan@hotmail.com">w.vichan@hotmail.com</a>
3		Ms. Rasamee Dhitikiattipong	Plant Pathologist professional level	Bureau of Rice Research and Development Ministry of Agriculture and Cooperatives	Email: <a href="mailto:rasamee@brrd.mail.go.th">rasamee@brrd.mail.go.th</a>
Trainers/Facilitators (Thailand)					
1	Dr. Banpot Napompeth		Founder & Advisor	National Biological Control Research Center (NBCRC), Kasetsart University	P.O. Box 9-52, Chatuchak Bangkok 10900 Phone/Fax: 0-2942 8252 Mobile: 081 841 5264 Fax: 0 2942 8355 Email: <a href="mailto:agrban@ku.ac.th">agrban@ku.ac.th</a>
2	Dr. Supakit Maketon		Managing Director	APPLIEDCHEM (THAILAND) CO., LTD	No 2., Lardpracao 76, Intersect 3-14 Ramindra Rd., Bangkhen Bangkok 10220 Tel: 02 971 7287-8 Cell: 081 912 8591 Email:

				<a href="mailto:Msupakit@hotmail.com">Msupakit@hotmail.com</a>
3	Dr. Amporn Winotai	Chief, Biological Control Research Group	Plant Protection Research and Development Office Department of Agriculture	Chatuchak, Bangkok 10900 Tel.: 66 2 5797580 ext 135 Fax: 66 2 940 6895 Email: <a href="mailto:winotai@yahoo.com">winotai@yahoo.com</a> ; <a href="mailto:amporn.w@doa.in.th">amporn.w@doa.in.th</a>
4	Mrs. Areepan Upanisakorn	Director Biological Control Sub- Pest Management Division	Bureau of Agricultural Products Quality Development The Department of Agricultural Extension Bureau of Agricultural Products Quality Development (Building 6) The Department of Agricultural Extension	Paholyothin Road, Bangkhen Jatujak Bangkok 10900 Tel: 02 579 3664 Mobile:08 1675 2800 Email: <a href="mailto:areepan03@yahoo.com">areepan03@yahoo.com</a>
5	Ms. Lawan Jeerapong	Pest Management Expert	Bureau of Agricultural Quality Development Department of Agricultural Extension (DOAE) Ministry of Agriculture and Cooperatives (MOAC)	21432/1 Phahonyothin Road, Latyao, Chatuchak Bangkok 10900 Tel: 66 2 940 6163 Fax: 66 2 940 6190 Email: <a href="mailto:Lawan.Jee@gmail.com">Lawan.Jee@gmail.com</a>
6	Dr. Tipvadee Attathom	Associate Professor	Department of Entomology, Kasetsart University , Kamphaengsaen Campus, THAILAND	Email: <a href="mailto:agriva@ku.ac.th">agriva@ku.ac.th</a>
7	Dr. Chiradet Chamsawang	Associate Professor	Department of Plant Pathology Faculty of Agriculture at KamphaengSae nKasetsartUnive rsity	Email: <a href="mailto:agrcdc@ku.ac.th">agrcdc@ku.ac.th</a>

			KamphaengSae nCampusNakho nPathom, THAILAND	
8	Mr. Vorachai Manomuth	Managing Director	Terragro Technology Co., Ltd , THAILAND	Email: <a href="mailto:vorachaim@cropteehasi.com">vorachaim@cropteehasi.com</a>
9	Ms. Suksom Chinvinijkul	Director , Irradiation for Agricultural Development	Department of Agricultural Extension Bureau of Agricultural Product Quality Development	Email: <a href="mailto:chinvinijkuls@gmail.com">chinvinijkuls@gmail.com</a>
10	Dr. Sopon Uraichuwn	Assistant Professor	Department of Entomology, Faculty of Agriculture, Kasetsart University, Kampaeng-Saen Campus,	Kasetsart University, Kampaeng-Saen Campus,Nakorn Pathom 73140 Tel. 0-3435-1886 Fax 0-3435-1886 E-mail : <a href="mailto:sopon.u@ku.ac.th">sopon.u@ku.ac.th</a>
11	Ms.Tasane Pradyabumrung	Senior Standards Officer	National Bureau of Agricultural Commodity and Food Standards (ACFS) Ministry of Agriculture and Cooperatives	50 Phahonyotin Rd., Chatuchak, Bangkok 10900 Tel: 662 561 2277 Fax: 662 561 3357 Email: <a href="mailto:tasanee@acfs.go.th">tasanee@acfs.go.th</a>
12	Ms. Supaluck Klubnuam	Director of Product Quality Promotion and Development Division	Department of Agricultural Extension Product Quality Promotion and Development Division Pahonyothin Road, Jatujak, Bangkok, 10900 Tel: (+66)029551512	21432/1 Phahonyothin Road, Latyao, Chatuchak Bangkok 10900 Email: <a href="mailto:kunjang@msn.com">kunjang@msn.com</a>
13	Ms. Sumana Simasalit	Subject Matter Specialist	Department of Agricultural Extension Phaholyothin Rd. Chatuchak , Bangkok	21432/1 Phahonyothin Road, Latyao, Chatuchak Bangkok 10900 Email: <a href="mailto:sumana_sima@hotmail.com">sumana_sima@hotmail.com</a>

			Tel. : 662-9551626	
FAO/RAP				
1	Mr. Johannes W. Ketelaar	Chief Technical Adviser Pesticide Risk Reduction in South-East Asia		IPM Component (GCP/RAS/229/SWE) FAO Regional Office for Asia and the Pacific 39 Maliwan Mansion, Phra Atit Road Bangkok 10200, Thailand Tel: 66 2 697 4274 Fax: 66 2 697 4445 Email: Johannes.Ketelaar@fao.org
2	Dr. Piao Yongfan	Senior Plant Protection Officer		FAO Regional Office for Asia and the Pacific 39 Maliwan Mansion, Phra Atit Road Bangkok 10200, Thailand Tel: 66 2 697 4268 Fax: 66 2 697 4445 Email: Yongfan.Piao@fao.org

## Appendix II

### Agenda

Date		Training Activities	By	Venue
25 Feb 2013	am 9.00-9.30	Opening Ceremony	DOAE Deputy Director-General	Miracle Grand Convention Hotel
	9.30 -10.00	Course Introduction	Dr Piao Yongfan	
	10.30-11.00	Break		
	11.00-12.00	Definitions of BC and BC in IPM System	Dr. Banpot Napompeth	
	pm 13.00-14.00	Biological control: Latest innovations in application by smallholder farmers in Asia	Mr. J. Ketelaar	Miracle Grand Convention Hotel
	14.00-15.15	Country Presentations Cambodia China Indonesia Lao PDR Myanmar	Participants	
	15.15-15.30	Break		
	15.30-17.15	Country Presentations continued Malaysia Nepal Philippines Vietnam Thailand	Participants	
	18.30	Welcome dinner	FAO	
26 Feb 2013	am 8.00-9.00	Thailand extension experience on BC	Ms. Lawan Jeerapong	Miracle Grand Convention Hotel
	9.00-9.30	Break		
	9.30-10.30	Microbial control for insect pests	Dr Tivadee Attathum	
	10.30-11.00	Microbial control efficiency on insect pests	Dr Tivadee Attathum	

	11.00-12.00	Quality control of microbial propagation	Dr Tivadee Attathum	Miracle Grand Convention Hotel
	12.00-13.00	Lunch		
	pm 13.00-14.30	Microbial control: for plant pathology	Dr.Chiradej Chamswarnng	
	14.30-15.00	Using <i>Trichoderma</i> sp. And <i>Bacillus subtilis</i>	Ms.Lawan Jeerapong	
	15.00-17.00	-Farmer promotion on microbial production Break -Production, marketing experience and trend in BCA business	Dr. Supakit Maketon (Apply Chemical Company)	
27 Feb 2013	am 8.00-9.00	-Lecture: Biology and ecology of insect natural enemies	Dr. Amporn Winotai	Miracle Grand Convention Hotel
	9.00-10.00	- Lecture: Production of some important insect predators and parasitoids and release methods	Dr. Amporn Winotai	
	10.00-10.30	- Lecture: Parasite and predator efficiency	Dr. Amporn Winotai	
	10.30-11.00	Break		
	11.00-12.00	-Lecture: Quality control of natural enemies mass rearing	Dr. Amporn Winotai	
	12.00-13.00	Lunch		
	pm 13.00-13.45	-Lecture: Farmer promotion on production of some important insect predators and parasitoids	Ms.Areepan Upanisakorn	Miracle Grand Convention Hotel
	13.45-14.45	-Lecture: Biology, ecology, classification of insect pests of some economic crops	Mr. Sopon Uraichuen	
	14.45-15.00	Break		

	15.00-16.00	- Lecture: Field survey of insect pests of some economic crops	Ms. Lawan Jeerapong	
	16.00- 1800	-Visit Pest Management Division Laboratory for mass rearing natural enemies	PMD staffs	
28 Feb 2013	am 6.00-12.00	Field survey of insect pests and natural enemies	Ms.Lawan Jeerapong Ms.Ravadee Proamkerd, Ms.Areepan Upanisakorn and Ms.Sumana Srimasarit	Vegetable field and fruit orchard at Rachaburi
	12.00-13.00	Lunch		
	pm 15.00-16.00	-Practice on insects and natural enemies classification (samples from field collection)	participants	Miracle Grand Convention Hotel
	16.00-16.30	Break		
	16.30-18.00	-Visit Biological Group, PMD for BC agents mass production	Staffs of Biological Control Group	Pest Management Division, DOAE
1 March 2013	am 8.00- 9.00	Insect pheromone promoted in Thailand	Mr.Vorachai Manomuth	Miracle Grand Convention Hotel
	9.00-10.00	Control of insect using radiation	Ms. Watchareeporn Orankanok or Ms.Suksom Chinvinijkul	
	10.00-10.30	Break		
	10.30-12.00	ISPM for import and release of exotic BCA	Ms.Tassanee Pradyabamrung	
	12.00-13.00	Lunch		
	pm 16.00-17.00	Back to the hotel		
2 March 2013	am 8.00-9.00	-Group discussion on training models	Participants	Miracle Grand Convention Hotel
	9.00-10.00	-Presentation of training models and session guides by each group	Participants	
	10.00-10.15	Break		

	10.15-10.45	- Discussion on regional cooperation on BC	Participants	
	10.45-11.15	- Course wrap up	Participants	
	11.15-12.15	-Award certificates, Closing ceremony	DG	
	pm 12.30-14.00	Lunch		
3 March 2013		Departure Bangkok - Home country		