ASEAN-AVRDC Regional Network for Vegetable Research and Development (AARNET)

Report on 11th AARNET Expert Consultation on "Vegetables for health: Essential role in supplying micro-nutrients for health"

24 March 2016, Palace of the Golden Horses, MINES, Kuala Lumpur, Malaysia

Opening Address by Ybrs Dr. Umi Kalsom Binti Abu Bakar, Deputy Director General of MARDI

Welcome International and local participants to "ASEAN-AVRDC Regional Network for Vegetable Research and Development (AARNET) Expert Consultation 2016 in the theme "VEGETABLES FOR HEALTH : The essential role of vegetable in supplying micro-nutrients". The aim of the meeting is to develop a strategy to converge agriculture, nutrition and health, to promote the importance of agricultural commodity standards for nutrition and health, to explore nutritional diversity of vegetables and to utilize the applications of AVRDC's Nutrient Database for integrating understanding of various vegetable nutrients and their benefits.

Workshop Overview by Dr. Fenton D. Beed, The Regional Director of AVRDC

Thanks to the hardworking team from MARDI and AARNET Secretariat to ensure the success of this consultation. The consultation will discuss priortization of regional approaches to increase linkages between vegetable consumption, nutrition and health. We belive that as most of the ASEAN countries are actively strengthening their research and development efforts, this expert consultation will provide the necessary platform to facilitate exchange of scientific information and knowledge on contemporary research and policy topics to benefit vegetable research to impact on development.

Keynote Presentation

"**Vegetables and Health"** **Assoc. Prof. Ratchanee Kongkachuichai,** Mahidol University, Thailand

Vegetables are very important for your health because they are dense in vitamins, minerals, and a great variety of natural antioxidants including carotenoids, flavonoids, anthocyanins, and various phenolic compounds.

Dietary fiber in vegetables could reduce the risk of overweight and obesity through reducing hunger while limiting overall energy intake. Adequate intake for fiber is 25 - 40 g for adults.

Potassium provided by fruits and vegetables play vital role in lowering blood pressure.

Folate can control Alzheimer's to coronary heart diseases, osteoporosis, and increased risk of breast, colorectal cancers, poor cognitive performance, and neural tube defects. Folate is necessary for normal development of the fetal spine, brain and skull and is essential for all humans and especially pregnant and nursing mothers.

Phytochemicals such as plant sterols, flavonoids, and other antioxidants such as vitamin C, vitamin E and carotenoids can modulate cholesterol and other biological processes to reduce the risk of non-communicable diseases (NCD). Phytochemicals are found in many vegetables and fruits

Anthocyanins are colored pigments in vegetables and are defined as a phytonutrient. These compounds give color and flavor to vegetables and protect them from ultraviolet rays, help to combat bacterial, viral and fungal infections.

Carotenoids are pro-vitamin A, plant pigments that give the deep yellow, orange, red and dark green colors of fruits and vegetables.

Eating various varieties of the colorful pigmented leafy vegetables and appropriate amount of protein, carbohydrate, low sugar, low salt and reduced fat can be a significantly therapeutic target to achieve appropriate metabolic control and further prevent onset of NCDs

Take home message; “Eat Foods as a Medicine but Don't Take Medicine as Foods”

“Understanding micronutrient deficiency: the convergence of agriculture, nutrition and health” **Assoc. Prof. Gina S Itchon** from School of Medicine Xavier University, The Philippines

Asia is the continent with the most hungry people – two thirds of the total. The percentage in southern Asia has fallen in recent years but in western Asia it has increased slightly. Globally, one in nine people in the world today (795 million) are undernourished.

This is due to many reasons including increasing population, environmental degradation, climate change effects, low educational levels, poverty, and poor maternal health, lack of potable water or sound hygiene standards and large families.

Macronutrition versus Micronutrition

Macronutrition: “macro” means large, macronutrients are nutrients needed in large amounts. Deficiency in any of these foods result in overt malnutrition, and depending on severity either acute or chronic and can include;

-Stunting (people are too short for their age)

- Wasting (people are too thin for their height)

- Obesity (people are overweight)

Micronutrition: “micro” means small and hence these compounds are only required in minuscule amounts. However, they are of critical importance as they enable the body to produce enzymes, hormones and other substances essential for proper growth and development. Micronutrient deficiency is also called ‘hidden hunger’ due to lack of vitamins and minerals e.g. vitamin A, Iodine, Iron, Zinc, Folic Acid, Calcium. ADD (Attention Deficit Disorder) reported to be due to lack of Zinc.

Folic Acid (Vitamin B9) Important for the development of a healthy fetus, as it can significantly reduce the risk of neural tube defects (NTDs). Essential in early pregnancy and sources are from dark leafy vegetables, broccoli, asparagus, citrus fruits, beans, peas, lentils, meat and fish.

Calcium is very important mineral in human metabolism, making up about 1-2% of an adult human's body weight and is used to control muscle and nerve function, as well as to manage acid/base balance in our blood stream.

Essential Points are that the effects of micronutrient deficiencies are profound and include premature death, poor health, blindness, stunting, mental retardation, learning disabilities, and low work capacity.

Tool chest of Effective Interventions include good nutrition combined with clean water, good sanitation and hygiene (WASH) breaks the vicious cycle.

" The importance of agricultural commodities standards for nutrition and health" Dr. Roongnapa Korpraditskul, Kasetsart University, Thailand

Nutritious food must be safe for consumers to gain benefits without being poisoned by likes of pesticides or heavy metals in municipal waste or dirty water. Food safety is a very important issue and has been recognized as a priority area in the region.

Role of NATIONAL BUREAU OF AGRICULTURAL COMMODITY AND FOOD STANDARDS (ACFS)

- Governmental agency under the Ministry of Agriculture and Cooperatives. Food trade has played an important role to secure world food security.
- System to ensure that both local and international consumers can always trust and enjoy food free of poisons.

Trend for produce:

- Innovations and value added- > Fresh produce (fresh-cut, salad-greens, consumer ready package)
- Sales distribution (direct sale from shipper to food services & retail)
- Access consumers through enriching market experience (emotional food , supply seasonally, beauty, appropriate serving size)
- Health awareness - > health benefit (organic, functional, aging, alternative sweetener, Information, self- medication)
- Trade policy / Food safety / Environmental /Social Awareness, Reduced poison contamination through increased traceability, Food miles used to produce and deliver produce, Fair trade)

"Nutritional diversity of vegetables and the applications of AVRDC Nutrient Database" Dr. Ray Yu Yang, AVRDC, Taiwan

Food and Nutrition Security now required through both a balanced diet and environment allowing a healthy and active life. Food and nutrition security exists when all people at all

times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life.

Vegetable, fruit, and phytonutrient consumption patterns in Taiwan and comparison with Korea and the United States:

- Food sources of the ten phytonutrients were diverse, mostly from the food groups of fruit, vegetables and tea;
- Phytonutrient intakes were higher in the populations who met the recommended intakes of fruit and vegetables (5 portions a day) than those who did not;
- Taiwanese diets are particularly rich in lutein/zeaxanthin (carotenoids) from green leafy vegetables such as sweet potato leaf, mustard leaf and kangkong, which confer varied health effects on target populations through the nutrients they confer.
- There is an urgent need to add other phytonutrients to the AVRDC database, and to carry out research to understand the relationship between phytonutrient consumption patterns and long-term health.

Challenges

- Fruit and vegetable production is intensive in terms of knowledge, inputs, labor, incurring high risks for the farmer and value chain actors.
- The produce is highly perishable and subject to large price fluctuations due to supply versus demand and due to seasonality.
- Often it is children who do not like to eat vegetables and simply increasing supplies of affordable fruit and vegetables may not result in greater consumption.
- Increased knowledge of the benefits of fruit and vegetables, many consumers will need additional incentives to actualize behavior change and increase consumption through choosing to vary their diets.

" Integrating understanding of various vegetable nutrients and benefits" Dr. Ali Asgar Rahmat, Indonesia Vegetables Research Institute, Bandung, Indonesia

- Vegetable commodities: agricultural commodities are easily developed well in fertile land, marginal lands, as well as in home gardens and able to increase greatly the income of farmers from relatively small plots.
- Vegetables: a source of vitamins and minerals. Ffiber content is also very important to aid digestion.
- Demand for vegetables increased according to the development of population and public awareness of the nutritional benefits of vegetables. This demand in turn encourages production increases every year.
- In order, to respond to public interest in cultivation of vegetables as being good for nutrition through household diets, there needs to be increased marketing plus household incomes. It is still necessary to increase awareness of the importance of vegetable nutrition for healthy functioning of a family.

- How to improve the nutritional status of a family is through the integration of food that is rich in nutrients into the diet. Increased consumption of vegetables have a very important role because of the nutrients contained in vegetables can correct nutrient deficiency symptoms.
- These integration efforts are often constrained by the supply of seasonal vegetables which resulted in price fluctuations, which in turn affect the level of consumption. According to AVRDC (1999), one of the efforts recommended to solve this problem was through the extraction and utilization of vegetable species that are more diverse, including traditional vegetables.
- There are several examples from Indonesia of traditional vegetables that are nutritious and require commercialization.

"**Nutritional and Chemical Evaluation, Antioxidant Capacity, and Antiproliferative Activity of *Cyphomandra betacea* (tamarillo) and *Solanum lycopersicum* (tomato)** " **Dr. Asmah Rahmat,** University Putra Malaysia, Malaysia

- The nutritional composition (ash, protein, carbohydrate, total dietary fibre), mineral analysis (calcium, magnesium, potassium and iron), phenolic and flavonoid content and antioxidant activities (β-carotene bleaching and scavenging assay) of tamarillo were significantly ($p < 0.05$) greater than tomato.
- GC-MS analyses of tamarillo also indicated the presence of important metabolites that probably involved in the antioxidant activities observed in this study. Thus, it can be concluded that tamarillo is a good source of antioxidant compounds and provide promise for use in nutraceutical or functional-food products.
- Findings indicated that tamarillo significantly inhibited growth of HepG2 and MDA cells *in vitro*, confirmed by MTT assay and morphological study. Besides, the low cytotoxicity of tamarillo it also acts as an anti-cancer agent without significant side effects.
- In conclusion, the present results provide evidence for the potential use of tamarillo in the prevention or even its therapeutic value on human breast and liver cancer.

Plenary reporting from Working Groups, questions and answers and plenary discussions

1. **Group 1: Awareness** (links between vegetables, nutrition and health)

    - Dr. Ratchanee Kongkachuichai, Expert from Thailand
    - Dr. Ali Asgar, Indonesia
    - Ms. Man Sotheavy, Cambodia
    - Ms. Normah Binti Tuah, Brunei
    - Dr. Bounneuang Douanboupha, Lao
    - Ms. Norfadzilah (MARDI staff)
    - Ms. Nor Hazlina (MARDI staff)
    - Mr. Mazlan (MARDI staff)
    - Ms. Umikalsum (MARDI staff)

→ Different sectors need to be targeted

Public

- home gardening (people can hand on and understand nutrition guidance)
- community Garden (apply to wider public)
- promote affordable + available + safe to eat and create demand to then drive supply

Government

- should apply policies that encourage eating vegetables.
- formal advertisements (TV program, radio, newspaper)
- campaigns and recipe demonstrations
- labeling to promote vegetable (e.g. nutrient types and amounts)

School

- education (special section in school dedicated to growing and eating vegetables and teachers trusted more than parents!
- initiate school gardens to teach business skills
- nutrient program built around school garden

Private sector

- create multimedia (e.g. internet, to promote the benefit of nutrient dense vegetables)
- health food restaurant (providing tasty food, inventive chefs and cooking competitions)
- develop products attractive to children (e.g. food decoration for kids, vegetable guide, minimal process, vegetable juice)

Questions and answers. How many sectors can effectively contribute to this awareness? Increase availability of vegetables and partner with Ministry of Health and Agriculture?

2. **Group 2: Research** (nutrient quantification and qualification)

- Dr. Ray Yu Yang, AVRDC Taiwan
- Dr. Asmah Rahmat, Expert from Malaysia
- Ms. Lu Bu, Myanmar
- Dr. Herminigilda Gabertan, Philippines
- Ms. Rahayu Anang (MARDI staff)
- Ms. Norma Hussin (MARDI staff)
- Dr. Rozlaily (MARDI staff)

- Research conducted in their own countries and not always shared across ASEAN
- Research focus on product quantity but need to focus also on quality (to nourish the population and not just feed the population)
- Analyses to create and meet consumer demand for quality food that is nutrient dense and safe
- Increase production while safeguarding environmental sustainability and food quality (nutrient content)
- Address missing link between food and nutritional security
- nutrition analysis includes in all research including breeding of new varieties
- each country to develop a list/profile of key national vegetables and nutrient benefits
- share research results with policy makers to guide regulatory frameworks
- Mutual training to increase capacity and linkages of agriculture leaders and researcher
- develop and share analytical protocols and procedures to identify and conserve nutrients

→ **3 Immediate action plan**

1. each country to provide the list/data
2. undertake national and regional working groups
3. conduct training so capacity equal between countries

Questions and answers: All steps of value chain and research needs nutrition parameters built into it from breeding protocols to agronomic methods to postharvest methods to household recipes.

Multi-disciplinarian research needed to produce nutrient dense vegetables and to ensure their consumer demand based on their superior nutrient content to increase health.

3. **Group 3: Regulation** (addressing micronutrient deficiencies and food safety)

- Dr. Roongnapa Expert from KU Thailand
- Dr. Leong Hon Keong, Singapore
- Dr. Grissana Linwattana, Thailand
- Dr. Nguyen Quoc Hung, Vietnam
- Ms. Rosnani (MARDI staff)
- Ms. Farahzety (MARDI staff)
- Mr. Shahmi (MARDI staff)
- Dr. Zaulia (MARDI staff)

Regulation for food safety and vegetable types to address micronutrient deficiencies in communities.

1. All countries have regulation frameworks for food safety (through food safety / food act) but difficult to regulate at scale
2. To address micronutrient deficiencies
    - promotion and education
    - targeted awareness campaigns
3. Not necessary to regulate as this increases consumer costs and reduces profit for value chain actors. However, if strongly regulate for certain period across ASEAN this could lead to improved standards and lack of need to regulate thereafter.
4. Way to promote micronutrient availability
    - serve healthy food (military, kitchen, school)
    - education
    - franchise (serve balance diet /meal in canteens, work places, communal facilities and not fast food rich in fat and sugar)
    - media (campaigns targeting social media)
    - integration between Government agencies (health, education, agriculture)
    - labeling fresh and processed food to promote demand

Why you need regulation for micronutrient + policy?

- There are ways to increasing micro nutrition

Questions and answers: Why should government regulate? Societal norms are much more influential than governmental rules e.g. if everyone accepts that safe food is a communal responsibility then mis-use of pesticides and use of unclean water and waste as fertilizer will not be tolerated. People within communities are much better at regulation of peers than governments.

Singapore is regional leader on methods and trade standards and could act as technical lead to support other countries. Singapore also has vested interest in food from ASEAN being safe as it exports many of these vegetables.

4. **Group 4: Partnerships:** (health sector?)

- Dr. Gina Itchon, Expert from Philippines
- Ms. Tan Ling Ling, Singapore
- Ms. Haji Hamdan Fuziah, Brunei
- Dr. Pauziah Muda, MARDI Malaysia
- Ms. Joanna (MARDI staff)
- Ms. Ismawaty (MARDI staff)
- Ms. Masnira (MARDI staff)

➔ Target

- Healthy nutrition in school rather than junk food (need partnerships and safe food)
- Ministry of Health
- Ministry of Agriculture

- Ministry of Education
- Private sector
- Young people who are easier to change than older people with more consistent diets

➔ Translate research into evidence to justify planning and policy actions

➔ Activities

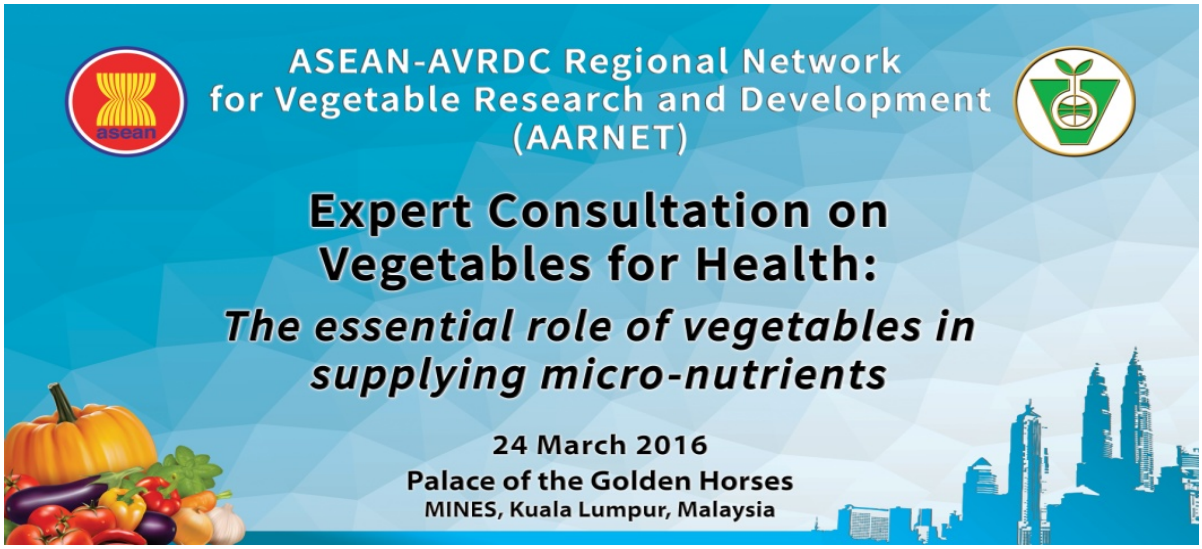
- School gardening
- Public canteens to expose consumers to better diets
- Include policy makers to create enabling environment
- Have multimedia include brochures, TV, road shows

Questions and answers: Link partners across ASEAN to share learning and success or otherwise of interventions and link Ministries listed above to enact platforms. ASEAN to publicize simple message on benefits of linking vegetables to nutrition to health understood across region to create awareness and demand for safe and nutritious vegetables.

Annex 1. Agenda for 24th March, AARNET Expert Consultation
Vegetables for health: Essential role in supplying micro-nutrients for health

07:30 - 08:00	Registration	MARDI
Opening Program		**Chair: Fenton Beed**
08.00 – 08:30	Opening Address	YBrs Dr. Umi Kalsom Binti Abu Bakar Timbalan Ketua Pengarah, Malaysian Agricultural Research and Development Institute (MARDI)
	Workshop Overview	Fenton D. Beed Regional Director, East and Southeast Asia and Oceania, AVRDC – The World Vegetable Center Bangkok, Thailand
	Keynote Presentation	
08.30- 09.15	Vegetables and Health	Assoc. Prof. Ratchanee Kongkachuichai, Director, The Institute of Nutrition, Mahidol University, Thailand
09.15 - 09.30	Group Photograph and Coffee / tea break	
Keynote Presentations		
09.30 – 10.15	Understanding micronutrient deficiency: the convergence of agriculture, nutrition and health	Assoc. Prof. Gina S Itchon, Associate Professor, School of Medicine Xavier University and Director, Sustainable Sanitation Center, Philippines
10.15 – 11.00	The importance of agricultural commodities standards for nutrition and health	Dr. Roongnapa Korpraditskul, Head of Research and Development Center for Agricultural Commodities standard, Kasetsart University, Kamphaeng Saen Campus, Thailand
11.00 – 11.30	"Nutritional diversity of vegetables and the applications of AVRDC Nutrient Database"	Dr. Ray-Yu Yang, Head of Nutrition, AVRDC – The World Vegetable Center, Taiwan
11.30 -12.00	Integrating understanding of various vegetable nutrients and benefits	Ali Asgar and Liferdi Lukman, Indonesian Vegetables Research Institute (IVegRI), Indonesia
12.00 – 13.00	Lunch	
Keynote Presentation		

13.00 – 13.30	Antioxidant and antiproliferative activity of *Cyphomandra betacea* and *Solanum esculentum* extracts on human breast and liver adenocarcinoma	Prof. Dr. Asmah Rahmat, Department of Nutrition and Dietetics, Faculty of Medicine and Health Science, Malaysia
Working Groups: Prioritization of regional approaches to increase linkages between vegetable consumption, nutrition and health AARNET Steering Committee Members and invited experts		
13.30– 14.45	5. Awareness (links between vegetables, nutrition and health) 6. Research (nutrient quantification and qualification?) 7. Regulation (addressing micronutrient deficiencies and food safety?) 8. Partnerships (health sector?)	
14.45 - 15.15	Coffee / tea break	
Plenary reporting from working Groups, followed by questions, answers and discussion		
15.15 - 15.30	Group 1: Awareness	
15.30 - 15.45	Group 2: Research	
15.45 - 16.00	Group 3: Regulation	
16.00 - 16.30	Group 4: Partnerships	
16.30 - 17.00	Discussion, summaries and next steps	



Annex 2. Participant list for 24th March, AARNET Expert Consultation
Vegetables for health: Essential role in supplying micro-nutrients for health

	Country	Name	Organization	Email
1	Brunei Darussalam	Ms. Haji Hamdan Fuziah Assistant Director of Agriculture	Department of Agriculture and Agrifood Ministry of Industry and Primary Resources Kilanas BG1121 Brunei Darussalam	fuziah.hamdan@gmail.com
2		Ms. Normah Binti Tuah Horticulturist, Vegetable Development Unit	Department of Agriculture and Agrifood Ministry of Industry and Primary Resources Kilanas BG1121 Brunei Darussalam	upss2011@gmail.com
3	Cambodia	Ms. Man Sotheavy Chief of Vegetable crop Office	Department of Horticulture and Subsidiary Crops (DHSC), General Directorate of Agriculture, Ministry of Agriculture	sotheavygda@yahoo.com
4	Indonesia	Dr. Ali Asgra Senior Research Scientist	Indonesian Vegetables Research Institute (IVegRI) Indonesian Agency for Agricultural Research and Development Ministry of Agriculture Bandung, Indonesia	asgar1957@yahoo.com
5	Laos	Dr. Bounnueng Douangboupha Director Hatdokeo Horticulture Research Station	National Agriculture and Forestry Research Institute (NAFRI) Ministry of Agriculture and Forestry Vientiane Lao PDR	dbounneuang@yahoo.com
6	Malaysia	Dr. Pauziah Muda Deputy Director Postharvest Handling Programme	Horticulture Research Centre Malaysian Agricultural Research and Development Institute (MARDI) MARDIUPM 43400 Serdang, Selangor, Malaysia	pauziah@mardi.gov.my
7	Myanmar	Mrs. Lu Bu Assistant Research Officer	Horticulture Section Department of Agricultural Research (DAR), Myanmar	lmoonlubu@gmail.com
8	Philippines	Dr. Herminigilda A. Gabertan Chief of the Bureau of Plant Industry Los Banos National Crop Research Development and Production Support Center (BPI-LBNCRDPSC)	Bureau of Plant Industry Department of Agriculture Republic of the Philippines 692 San Andres St Malate, Manila, 1004 Philippines	bpi_lbncrdc@yahoo.com.ph

9	Singapore	Dr Leong Hon Keong Incoming Group Director, Technology & Industry Development Group	Agri-Food & Veterinary Authority of Singapore 52 Jurong Gateway Road, #14-01 Singapore 608550	leong_hon_keong@ava.gov.sg
10		Ms Poh Bee Ling Director, Horticulture Technology Department	Sembawang Research Station Lorong Chencharu, Singapore 769194	poh_bee_ling@ava.gov.sg
11	Singapore	Ms Tan Ling Ling Principal Manager, Horticulture Technology Department	Sembawang Research Station Lorong Chencharu, Singapore 769194	tan_ling_ling@ava.gov.sg
12	Thailand	Dr Grisana Linwattana Senior Agriculture Scientist Horticulture Research Institute	Department of Agriculture Chatuchak, Bangkok 10900, Thailand	linwattana@chaiyo.com
13	Vietnam	Dr. Nguyen Quoc Hung Director General	Fruit and Vegetable Research Institute Trau Quy, Gia Lam, Ha Noi, Viet Nam	hungnqrifav@hn.vnn.vn
AVRDC - The World Vegetable Center				
14	Thailand	Dr. Fenton Beed Regional Director	AVRDC The World Vegetable Center, East and Southeast Asia Bangkok, Thailand	fenton.beed@worldveg.org
15	Thailand	Ratchada Thongkrailad Finance Officer	AVRDC The World Vegetable Center, East and Southeast Asia Bangkok, Thailand	ratchada.thongkrailad@worldveg.org
16	Thailand	Kanokwan Rattanamung Office Secretary	AVRDC The World Vegetable Center, East and Southeast Asia Bangkok, Thailand	kanokwan.rattanamung@worldveg.org
17	Taiwan	Dr. Ray-Yu Yang	AVRDC-The World Vegetable PO Box 42, Shanhua Tainan 74199	ray-yu.yang@worldveg.org
18	Philippines	Dr. Gina Itchon	Associate Professor, Department of Preventive and Community Medicine Director, Sustainable Sanitation Center Xavier University	gitchon@xu.edu.ph
19	Thailand	Assoc. Prof. Dr. Ratchanee Kongkachuichai	Director, Institute of Nutrition, Mahidol University Salaya, Phuthamonthon, Nakhon-Pathom 73170, Thailand 662-8002380;Fax 622-4419344	ratchanee.kon@mahidol.ac.th
20	Thailand	Dr. Roongnapa Korpraditskul	Head of Research and Development Center for Agricultural Commodities standard Kasetsart University, Kamphaeng Saen Campus Thailand	rdirnk@ku.ac.th

Malaysia – local participants				
21	Malaysia	Noraini Binti Dato' Mohd Othman	Program Keselamatan Dan Kualiti Makanan Kementerian Kesihatan Malaysia, Blok E1,E3,E6,E7 &E10, Kompleks E, Pusat Pentadbiran Kerajaan Persektuan,62590,Putrajaya Malaysia	
22	Malaysia	Dato' Naimah binti Ramli	Bahagian Industri Tanaman Ternakan dan, Perikanan (ITTP),blok 4G1 Wisma Tani,No.28 Persiaran Perdana Presint 4, Pusat Pentadbiran Kerajaan Persekutuan,62624 Putrajaya Malaysia	
23	Malaysia	Mr. Nordin Bin Nok	Lembaga Pertubuhan Peladang Menara LPP, No.20 Jalan Sultan Salahuddin 50480 Kuala Lumper,Malaysia	nurhamizahasbullah@yahoo.com.my
24	Malaysia	Mr. Shahmi Bin Awang	Fama, Bangunan FAMA Point Lot 17304 Jalan Persiaran 1, Bandar Baru Selayang 68100 Batu Caves,Selangor,Malaysia	shahmi@fama.gov.my
25	Malaysia	Khasavo Ibruim	Jabatan Pertanian,Aras 10,Wisma Tani ,Lot 4G2 Presint4,No.30, Persiaran Perdana, Pusat Pentadbiran Kerajaan Persekutuan,62632 Putrajaya	
26	Malaysia	Ms. Normah Binti Omar	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	normaho@mardi.gov.my
27	Malaysia	Dr. Mohd Norowi bin Hamid Umikalsim Mohamed Bala	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	norowi@mardi.gov.my / umi@mardi.gov.my
28	Malaysia	Dr. Omran bin Hashim	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	omranh@mardi.gov.my
29	Malaysia	Dr. Rozlaily Zainol	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	roz@mardi.gov.my
30	Malaysia	Dr.Razali Mustaffa	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	razally@mardi.gov.my
31	Malaysia	Mr.Wan Zaki Wan Mamat	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	wanzaki@mardi.gov.my

32	Malaysia	Dr. Zulhazmi Sayuti	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	zulhaz@mardi.gov.my
33	Malaysia	Dr. Zaulia Othman	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	zaulia@mardi.gov.my
34	Malaysia	Dr. Ainu Husna M S Suhaimi	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	Shusna@mardi.gov.my
35	Malaysia	Mr. Mohd Arzairimeen Ariffin	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	imeen@mardi.gov.my
36	Malaysia	Ms. Nor Hazlina Mat Sa'at	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	nor@mardi.gov.my
37	Malaysia	Ms. Suhana Omar	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	hana@mardi.gov.my
38	Malaysia	Ms. Farahzety Abdul Mutalib	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	farahzety@mardi.gov.my
39	Malaysia	Mr. Mohammad Abid Ahmad	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	abid@mardi.gov.my
40	Malaysia	Ms. Norfadzilah Ahmad Fadzil	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	fadzikah@mardi.gov.my
41	Malaysia	Ms. Rahayu Anang	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	arahayu@mardi.gov.my
42	Malaysia	Ms. Joanna Cho Lee Ying	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	Joanna@mardi.gov.my
43	Malaysia	Ms. Siti Aisyah Abdullah	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	ctaisyah@mardi.gov.my

44	Malaysia	Ms.Wan Mahfuzah Wan Ibrahim	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	mahfuzah@mardi.gov.my
45	Malaysia	Ms. Rosnani A. Ghani	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	rosnani@mardi.gov.my
46	Malaysia	Ms. Norma Hussin	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	normahus@mardi.gov.my
47	Malaysia	Ms. Noor Ismawaty Nordin	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	ismawaty@mardi.gov.my
48	Malaysia	Ms. Masnira Mohammad Yusof	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	mmyusof@mardi.gov.my
49	Malaysia	Ms. Nur Aida Mohd Pedzil	Malaysian Agricultural Research and Development Institute (MARDI),Persiaran MARDI-UPM,43400 Serdang,Selangor,Malaysia	nuraida@mardi.gov.my
50	Malaysia	Mazlam Shanordin	Fama, Bangunan FAMA Point Lot 17304 Jalan Persiaran 1, Bandar Baru Selayang 68100 Batu Caves,Selangor,Malaysia	mazlam@fama.gov.my
51	Malaysia	Uhainul Amri b. Ahmad	DOA	uhainulamri@doa.gov.my
52	Malaysia	Dr. Desa Hassin	TF Vict.org	desathai@yahoo.com
53	Malaysia	Dr.Siti Zahuch Suliman	UPM	sitizehuch@gmail.com