SEAVEG 2014

Families, Farms, Food

Book of Abstracts

Regional Symposium on Sustaining Small-Scale Vegetable Production and Marketing Systems for Food and Nutrition Security

25-27 February 2014
Bangkok, Thailand

AVRDC
The World Vegetable Center

SEAVEG 2014: Families, Farms, Food

Regional Symposium on Sustaining Small-Scale Vegetable Production and Marketing Systems for Food and Nutrition Security

25-27 February 2014

Centara Grand at Central Plaza Ladprao

Bangkok, Thailand

AVRDC – The World Vegetable Center ● Department of Agriculture (DOA), Thailand ● Food and Agriculture Organization of the United Nations ● Horticultural Science Society of Thailand (HSST) ● Kasetsart University ● Vegetable Science International Network (VEGINET) ● ASEAN-AVRDC Regional Network on Vegetable Research and Development (AARNET)

SPONSORS

Gold Level Sponsor (US$ 5,000)

East-West Seed Company, Ltd.
No. 50/1 Moo 2, Sainoi-Bang Bua Thong Rd., Amphur Sainoi
11150 Nonthaburi, Thailand
E-mail : info.th@eastwestseed.com

General

Food and Agriculture Organization of the United Nations (FAO)

AVRDC – The World Vegetable Center

Department of Agriculture (DOA), Thailand

Vegetable Science International Network (VEGINET)

Horticultural Science Society of Thailand (HSST)

Kasetsart University (KU)

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

Book of Abstracts

SEAVEG 2014 COMMITTEES

Coordination Committee

Chair:	Prem Nath (VEGINET)
Vice Chair:	Jacqueline d'Arros Hughes (AVRDC)
Members:	Hiroyuki Konuma (FAO)
	Robert J. Holmer (AVRDC)
	Suwit Chaikiattiyos (DOA)
	Grisana Linwattana (DOA)
	Poonpipope Kasemsap (KU)
	Kanokrat Sittipoch (HSST)
	Philip Chew Hong (AARNET)

National Organizing Committee

Chairman:	Dumrong Jirasutas (DOA)
Vice Chairman:	Suwit Chaikiattiyos (DOA)
Members:	Derake Tonpayom (DOA)
	Grisana Linwattana (DOA)
	Peyanoot Naka (DOA)
	Poonpipope Kasemsap (KU)
	Virach Chantrasmi (HSST)
	Kanokrat Sitipoch (HSST)
	Robert Holmer (AVRDC)
	Subash Dasgupta (FAO)

Scientific Committee

Chairman:	Jacqueline d'Arros Hughes (AVRDC)
Vice Chairman:	Poonpipope Kasemsap (KU)
Members:	Subash Dasgupta (FAO)
	Om P. Dutta (VEGINET)
	Saichol Ketsa (KU)
	Suwit Chaikiattiyos (DOA)
	Grisana Linwattana (DOA)
	Suraphong Kosiyachinda (HSST)
	Virach Chantrasmi (HSST)

Technical subcommittee

Mohamad Roff Mohd. Noor (Malaysian Agricultural Research and Development Institute, MARDI)

Robert de la Peña (East West Seed Company, Thailand)

Visith Chavasit (Mahidol University)

Chritian Genova II (Consultant)

Gek Hoon Khoo (Agri-Food & Veterinary Authority, Singapore)

SYMPOSIUM INFORMATION

Date and venue
The Regional Symposium on "*Sustaining Small-Scale Vegetable Production and Marketing Systems for Food and Nutrition*" will be held from 25 to 27 February 2014 at Centara Grand at Central Plaza Ladprao, Bangkok, Thailand.

Facilities
The symposium secretariat office will be set up near the main conference room to facilitate and assist delegates and participants during the symposium. Services will be available from 0800 -1800 hrs from 25-27 February 2014.

Language
The official language is English. No translation will be available during the symposium.

Symposium registration
Registration is required to attend all scientific sessions.

Registration fee
On-site registration at the start of the symposium may be done at the following rates:

- US$ 70 or THB 2,100 for students
- US$ 120 or THB 3,600 for residents of ASEAN member states and members of the organizing institutions
- US$ 220 or THB 6,600 for residents from non-ASEAN member states.

Registration fees will cover a conference bag with book of abstracts, access to all plenary and poster sessions and parallel working groups, welcome drinks, coffee/tea breaks and lunches.

Please note that registration forms received without payment do not constitute registration. Upon acceptance of registration and payment of fee, a "Registration Card" will be issued to the participant.

Visual aids
A computer and LCD projector will be available to assist the speakers for their oral presentation.

Excursion
For an additional fee of US$ 30 or THB 900 to be paid at the registration desk, an excursion will be arranged for interested participants on 27 February 2014.

Foreword

Dear Participants of SEAVEG 2014,

In January 2012, a successful SEAVEG Regional Symposium was held in Chiang Mai, Thailand, which gave an important stimulus to the regional vegetable industry, particularly in Thailand. More than 220 participants of 24 countries attended this important event, harnessing the great and rare opportunity to share their views and expertise by looking deeply into various aspects of vegetable production, supply and demand in the region, with particular emphasis on cross-sectoral issues.

The General Assembly of the United Nations has declared the year 2014 as the "International Year of Family Farming", recognizing the important contribution that family farming and smallholder farming can play in providing food and nutrition security and eradicating poverty in the attainment of the internationally agreed development goals, including the Millennium Development Goals.

In this context, affirming that family farming and smallholder farming are an important basis for sustainable food production aimed at achieving food and nutrition security, Thailand's Department of Agriculture (DOA) together with AVRDC – The World Vegetable Center, the Food and Agriculture Organization of the United Nations (FAO), Kasetsart University (KU), the Horticultural Science Society of Thailand (HSST), the Vegetable Science International Network (VEGINET) and ASEAN-AVRDC Regional Network on Vegetable Research and Development (AARNET) have agreed to convene the Regional Symposium "SEAVEG 2014: Families, Farms, Food - Sustaining Small-Scale Vegetable Production and Marketing Systems for Food and Nutrition Security" from 25 to 27 February 2014 in Bangkok, Thailand.

Personally, it is my pleasure to acknowledge the valuable efforts and contributions of our colleagues from the organizing institutions, namely AVRDC, FAO, KU, HSST, VEGINET and AARNET in organizing this event and to recognize the financial contribution from various business companies to make SEAVEG 2014 possible.

On behalf of the SEAVEG 2014 National Organizing Committee, I warmly welcome representatives from academic and research institutions, the farming, civil society and private business sectors as well as from government and non-government organizations to this important symposium sharing their knowledge, thoughts and ideas to further sustainably advance the vegetable sector in the region.

With best wishes for a pleasant and productive stay.

Dumrong Jirasutas

Director General of the Department of Agriculture

Chairman, SEAVEG 2014 National Organizing Committee

Dear Participants of SEAVEG 2014,

Vegetables are the major component of horticulture which is recognized as the second line of defense with cereals in the front line of the global food domain. Asia is endowed with favorable natural environments and climate to grow quality vegetables to meet domestic and international requirements. The higher production and market value of vegetables have been well acknowledged and Asia has been recognized as one of the major producers in the world. During the SEAVEG 2012 meeting, we had committed to act together to make Asia as the largest producer of vegetables to feed not only Asia but also to export to other regions of the world. The commodity of vegetables has identified itself as a cash crop to benefit growers, a good product for marketing and a healthy food for consumers.

The timely birth of SEAVEG for the betterment of the vegetable industry in the region has given promising hope for improved policies, technological research and development, infrastructure growth, efficient market networks and supply chains, and other necessary advancements in the interest of both producers and consumers. The upcoming regional symposium SEAVEG 2014 offers an opportunity for the organizers and participants to look deeply into various aspects of the vegetable value chain and related industries and identify the areas of opportunity, bottlenecks and to suggest solutions.

We welcome participants from scientific and research institutions with innovative ideas, progressive farmers with new practices followed by higher production, industries with new tools, techniques and investment, and policy makers with vision to enrich this gathering by sharing their knowledge and ideas. Moreover, the topics small-scale farming, family farming, urban and peri-urban vegetable production will provide additional value to this symposium.

It is the right opportunity for me to acknowledge the valuable efforts and contribution of the organizing institutions, namely DOA, AARNET, AVRDC, VEGINET and HSST, giving birth to SEAVEG which has started walking with the promise to serve the vegetable industry of the region. Further, the support of the Regional Office for Asia and the Pacific of the Food and Agriculture Organization of the United Nations and Kasetsart University has strengthened this organization and event.

On behalf of SEAVEG 2014, we look forward to the pleasure of meeting you during this important event.

Dr. Prem Nath

Chairman

SEAVEG 2014 Coordination Committee

Theme Areas and Sessions

The symposium is divided into five technical sessions to review small-scale vegetable farming, processing and marketing, to encourage improvement in the sustainability of vegetable production, promotion of vegetable consumption for better nutrition and health, to examine policy and development aspects, to attract industry profitability and competitiveness, and to enhance the performance of the vegetable industry in Southeast Asia.

Session 1: Small-scale Farming Systems
Topics include small holdings and farming status, contribution of farm families in food production, measures to improve small-scale farming systems as well as home, school and other public facility gardens.

Session 2: From Seed to Harvest
Topics include germplasm, breeding, seed and plant health, integrated crop management with a focus on Good Agricultural Practices (GAP), low-input / organic vegetable production, and ASEAN indigenous vegetables.

Session 3: From Harvest to Table
Topics include vegetable postharvest technologies, postharvest loss prevention, Good Manufacturing Practices (GMP), cold chain management, vegetable economics and marketing, supply chain model simulation, food safety, health and nutrition aspects of vegetables, food consumption and nutrition in the 21st century, and measures to improve the role of vegetables in nutrition.

Session 4: Cross-sectoral Issues
Topics include contributions of vegetable research and development to addressing cross-sectoral issues such as climate change, gender equity, ecological sanitation, urban and regional planning, urban and peri-urban horticulture, disaster risk management and microfinancing.

Session 5: Enabling Policies
Topics will examine present policies and programs in the sector and suggest changes related to issues mentioned in sessions 1 to 4.

RECOMMENDATIONS

of the

SEAVEG2012 Regional Symposium

High Value Vegetables in Southeast Asia: Production, Supply and Demand

January 24-26, 2012

Chiang Mai, Thailand

The following recommendations were made on the conclusion of the Regional Symposium: High Value Vegetables in Southeast Asia- Production, Supply and Demand (SEAVEG-2012) held on January 24-26, 2012 in Pang Suan Keaw, Chiang Mai, Thailand. More than 200 participants from 25 countries attended. It was organized by the Department of Agriculture (DOA), Thailand; AVRDC – The World Vegetable Center (AVRDC), Taiwan; the ASEAN-AVRDC Regional Network (AARNET), the Vegetable Science International Network (VEGINET) and the Horticultural Science Society of Thailand (HSST).

General

1. Vegetables were recognized as
    a. contributing to food security,
    b. having a major role in nutritional security, and
    c. providing employment and income generation.

2. As a largest producer of vegetables globally, Asia should focus on improving quality and yield to fulfil the demand of emerging national, regional and international markets.

3. ASEAN should develop its own quality and marketing standards of vegetables to meet national and export as well as import requirements; this should not preclude adoption of local standards where appropriate.

4. Marketing and supply chain structure should be improved to facilitate national marketing, and laws enacted to encourage regional trade among the Asian nations.

5. The vegetable research and development should focus on
    a. consumer preferences
    b. increased yield,
    c. nutritional quality,
    d. nutraceutical quality, and
    e. marketing quality.

I. Technology Development

1. There is need to modernize nurseries with effective quality control systems and accreditation for ensuring production and sale of genuine, true-to-type, disease free **planting material** of vegetable crops using micro-propagation and improved seedling production methods; use of molecular markers should be encouraged for assessing the genetic purity of seed and planting material.

2. **Climate change** and climatic events such as droughts and floods can cause huge crop losses, leading to food scarcity and economic losses. Since many drought-short-duration vegetable and root / tuber crop varieties are available, contingency plan modules involving vegetables, root / tubers crops should be developed and standardized for various agro-climatic and crop production system to mitigate risk.

3. The WHO/FAO have already identified some **under-studied areas of research** based on the already available scientific evidence of the preventive health role of vegetables, spices, tuber crops and medicinal plants, based on nutritional values, phytochemicals, nutraceuticals and antioxidants.

4. **Protocols and technologies** should be developed for production of botanicals / plant products, bio-pesticides and biological control agents at the farm levels and farmers need to be trained in production of these at the farm/village/community level through Farmer Field Schools or Farm Health Clinics. This would generate employment for rural youth and reduce rural unemployed youth from migration to urban areas in search of employment and livelihood security.

5. **Pesticide residue limits** and safe waiting periods for different vegetable crops and chemicals may be determined and documented to overcome the non-tariff trade barriers imposed by different countries for export-import of vegetable produce.

6. The **post harvest losses** of about 20-25% occur at harvest and on farm. Simple, low-cost postharvest technologies are already available but need to be made known and available to the farming community.

7. The majority of the vegetable processing facilities are season-specific and machinery is crop -specific, thus the facilities are usually idle during off-seasons, creating substantial local unemployment. To overcome this there is a need to develop **multi-utility, multi-crop processing machinery/facilities**, so that the facilities can run year round, being more efficient and providing employment.

8. **Organic production**: validation of various organic practices with respect to different vegetable crops and assessing the cost-benefit ratios to identify and advocate the preferred vegetable crops suitable for different organic farming practices.

9. **Urban and peri-urban production of vegetables** may be encouraged by the national and local governments with participation from various extension agencies, research institutes and universities for developing varieties and technologies best suited to urban and peri-urban production systems and value chains.

II. Policy Issues

1. **Resources/funding**: Policy makers and donors have to enhance support for the vegetable sector, allowing growers and their products to compete in the national, regional and global markets; these markets are increasingly constrained by quality standards and phytosanitary concerns and regulations. Only then will the silent vegetable revolution currently underway, benefit a significant portion of the world's poor nations, growers, and landless laborers and enable them to overcome poverty and food insecurity.

2. **Extension/training**: Effective partnership can be established between the private and public sectors with regard to extension and training. The public sector can take the lead in generating information on basic research, training and the enforcement of regulatory policies, whereas the private sector can enhance the flow of technologies for the benefit of growers and consumers.

3. **Dryland horticulture** needs to be promoted on a large scale, maximizing water productivity, to improve the livelihood security options of millions of small-scale marginal farmers.

4. **Efficient supply chain management**, by linking small holders and producers to market, is required. Small holders should regularly receive information on the domestic, national and international prices of vegetable commodities, demand and supply, quality of vegetable inputs, sales and returns, and to be able to understand the customer's/consumer's needs to place their produce effectively to compete in a vibrant market.

5. **Infrastructure development**: Since processing of horticulture produce is usually concentrated in the urban areas, efforts may need to be made to extend those facilities to the rural and peri-urban areas possibly through public-private partnerships.

6. There is a lack of availability of production technologies, marketing and credit facilities and processing and storage facilities and other infrastructure for the **small-scale farmers** who form about 75-85% of the farmer community, whose livelihood is at stake. Establishment of **small-scale industries** and creation of collection centers and co-operative marketing networks would help the livelihoods and minimize risk for many smallholder farmers.

7. **Food and nutritional security and employment generation**: As Asia has a large proportion of the world's population, food, and nutritional security and the need for employment have challenged livelihood security. Awareness and education programmes must be accelerated at all levels including farmers and policy makers and existing policies to augment food and nutritional security must be reviewed.

8. **Phytosanitary certification standards** for various vegetable crops for import/export need to be reassessed on a national, regional and global basis with respect to emergence of new insect pests or diseases which may be of quarantine significance.

9. **Transfer of technology**: Research-Extension-Farmer linkages must be reviewed to increase efficiency in transfer of technologies from both the public and the private sectors. Transfer of technologies should be through a participatory approach and refined for different agro-climatic conditions.

10. **Capacity building:** Global markets have become more dynamic and open in AOA (Agreement on Agriculture)/WTO (World Trade Organization), the benefit of which can be achieved by developing nations in promoting exports of vegetable produce. There is need to provide information and assistance for better understanding of, and compliance with, WTO regulations by all those in the vegetable value chain.

11. **Technical cooperation:** Strong linkages should be established within and among countries and networking of institutes and organizations for exchange of information and technologies, seed and planting materials and expertise for mutual benefit and development of horticulture. The FAO (Food and Agriculture Organization of the United Nations) under the umbrella of TCDC (Technical Cooperation among Developing Countries) may act as facilitator for formation and strengthening of such networks like VEGINET which was established during the International Conference on Vegetables (ICH-2002) during 2002 and other such networks like AARNET {ASEAN [Association of Southeast Asian Nations] and AVRDC [AVRDC-The World Vegetable Centre] Regional Network}.

III. Follow Up Action

The General Assembly of the Regional Symposium: High Value Vegetables in Southeast Asia- Production, Supply and Demand (SEAVEG-2012) has decided:

1. To submit the **Proceedings and Recommendations** of the symposium to various government and private sector organizations of Asian countries and to the regional and international organizations like ASEAN, AARNET, VEGINET, AVRDC, FAO, ICRISAT, ICARDA and others for their consideration and action.
2. To hold the **Second Regional Symposium**: High Value Vegetables in Southeast Asia- Production, Supply and Demand (SEAVEG) along with the Second International Conference on Vegetables (ICV) in early 2014.
3. To review the **Action Taken Report** on the recommendations of the SEAVEG-2012 during the next symposium to be held in early 2014.

SEAVEG 2014: Families, Farms, Food

Regional Symposium on Sustaining Small-Scale Vegetable Production and Marketing Systems for Food and Nutrition Security

25-27 February 2014
Bangkok, Thailand

Program

25 February 2014 (Tuesday)

Opening Session (Plenary)
Venue: Grand Ballroom B

07:30-08:30 Registration

08:30-08:40 **Introduction to Symposium and Logistics**
Sheila de Lima
AVRDC – The World Vegetable Center

08:40-08:50 **Inaugural Remarks**
Prem Nath
Former Assistant Director-General, Food & Agriculture Organization (FAO)
Chairperson, Vegetable Science International Network (VEGINET),
Karnataka State, India

08:50-09:00 **Welcome Remarks**
Ananta Dalodom
President, Horticultural Science Society of Thailand

09:00-09:10 **Welcome Address**
Poonpipope Kasemsap
Vice President, International Relations
Kasetsart University, Bangkok, Thailand

09:10-09:20 **Symposium Report**
Dumrong Jirasutas
Director General, Department of Agriculture, Bangkok, Thailand

09:20-09:40 **Inaugural Address**
Hiroyuki Konuma
Assistant Director-General and Regional Representative
FAO Regional Office for Asia and the Pacific, Bangkok, Thailand

09:40-10:00 **Inaugural Speech**
Chavalit Chookajorn
Permanent Secretary, Ministry of Agriculture and Cooperatives, Thailand

10:00-10:10 **VEGINET International Award**
for the Outstanding International Vegetable Scientist of the Year

10:10-10:20 Group Photo

10:20-10:30 Opening of Poster Session

10:30-10:50 Coffee / Tea Break

10:50-11:10 **Keynote Speech**
Southeast Asian vegetable production – A vision for the next 40 years to bring prosperity to the poor and health for all 37
Jacqueline d'Arros Hughes
Deputy Director General - Research
AVRDC – The World Vegetable Center, Shanhua, Taiwan

11:10-11:30 **Keynote Speech**
The role of private seed companies in the development of small scale farming systems 38
Joost Pekelharing
President of East West Seed Group
East West Seed International limited, Bangkok, Thailand

11:30-11:50 **Keynote Speech**
Vegetable production in Asia: Innovation, involvement, income and impact 39
Subash Dasgupta
Senior Plant Protection Officer
FAO Regional Office for Asia and the Pacific, Bangkok, Thailand

11:50-12:00 *Open Forum*

12:00-13:30 Lunch Break

Masters of Ceremony:

Sheila Aclo de Lima
Administrative and Training Officer, AVRDC – The World Vegetable Center, Bangkok, Thailand
Orathai Wongmetha
Department of Agriculture, Bangkok, Thailand

Session 1: Small-Scale Farming Systems

Venue: ***Grand Ballroom B***
Chair: Christian Genova II
Consultant, Agricultural Economics, Philippines

13:30-13:50	**Session Opening Speech** **The CGIAR research program on integrated systems for the humid tropics in Southeast Asia** Victor Afari-Sefa *Global Theme Leader – Consumption and Head of Socioeconomics Research and Monitoring and Evaluation Group* *AVRDC - The World Vegetable Center Eastern and Southern Africa, Arusha, Tanzania*	41
13:50-14:05	**Healthier families, wealthier farmers: Vegetable growing benefit to indigenous peoples in Northeastern Cambodia** Annick Schubert *Project Manager Annâdya, Ratanakiri, Cambodia*	42
14:05-14:20	**Evaluation of xiao bai cal (*Brassica chinensis*) varieties for cultivation in Singapore** S.L. Fong *Horticulture Technology Department, Agri-Food & Veterinary Authority of Singapore*	43
14:20-14:35	Questions & Answers	
14:35-14:50	**Effect of drip irrigation and mulching on yield, water use efficiency and economics of tomato** S.K. Biswas *Irrigation and Water Management Division, Bangladesh Agricultural Research Institute, Bangladesh*	44
14:50-15:05	**Quality vegetable production through fertigation system** Md. Abdur Razzaque Akanda *Irrigation and Water Management Division, Bangladesh Agricultural Research Institute, Gazipur, Bangladesh*	45
15:05-15:20	**Growth and yield of corn as affected by different row inter cropping patterns with indeterminate tomato in Southeastern Ifugao, Philippines** Lydia C. Medina *College of Agriculture and Forestry, Ifugao State University, Ifugao, Philippines*	46
15:20-15:30	Questions & Answers	
15:30-16:00	Coffee/Tea Break	
16:00-16:15	**Integrated homestead farming and nutrition: Bangladesh experience** Lalita Bhattacharjee *Food and Agriculture Organization, Dhaka, Bangladesh*	47
16:15-16:30	**Optimizing home yard spaces for integrated vegetable production: A case study of Bali, Indonesia** Ida Bagus Surawan *Assessment Institute for Agricultural Technology of Bali, Bali, Indonesia*	48

16:30-16:45	**Trained Master Gardeners Promoting Vegetable Production in Urban Households and Schools** Lala A. Kumar *University of Missouri Extension, USA*	49
16:45-17:00	Questions & Answers	
17:00-17:15	**Growth and yield of pechay (*Brassica chinensis*) applied with different rates of vermicast** Susana A. Edwin *Abra State Institute of Sciences and Technology Main Campus, Lagangilang, Abra, Philippines*	50
17:15-17:30	**Indigenous vegetables, fishes and shells integrated in the native rice farming systems in the province of Ifugao** Teresita D. Allig *Ifugao State University, Ifugao , Philippines*	51
17:30-17:45	Questions & Answers	
19:00-21:00	**Welcome Dinner**	

Session 2: From Seed to Harvest

Parallel session 2a: Germplasm and breeding

Venue: ***Ladprao 1***

Chair: Robert de la Peña
Head, R&D Operations and Product Development
East-West Seed International Ltd.

13:00-13:20	**Session Opening Speech** **Identifying objectives for breeding improved vegetable varieties: hard but vital choice** Prem Nath *Former Assistant Director-General, FAO* *Chairman, Prem Nath Agricultural Science Foundation (PNASF), Bangalore, India*	53
13:20-13:35	**Genotype x environment interaction and stability analysis of yield and components traits in French bean (*Phaseolus vulgaris* L.)** Akhilesh Sharma *Department of Vegetable Science and Floriculture, CSK Himachal Pradesh Agricultural University, Palampur, India*	54
13:35-13:50	**Screening for high beta carotene and lycopene in tomato** Ratchanee Siriyan *Sisaket Horticultural Research Center, Sisaket, Thailand*	55
13:50-14:05	Questions & Answers	
14:05-14:20	**The selection of onion varieties in off-season production** Orathai Wongmetha *Chiang Mai Royal Agricultural Research Center, Department of Agriculture, Chiang Mai, Thailand*	56
14:20-14:35	**Varietal evaluation, on-farm trials and seed production of organic vegetables in Central Luzon, Philippines** Arturo O. Manipon *Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines*	57
14:35-14:50	**Performance studies of different oriental pickling melon (*Cucumis melo* var. *Conomon*) genotypes under northern dry zone of Karnataka** Vasant M. Ganiger *College of Horticulture*, *Department of Vegetable Science, University of Hortic ultural Sciences, Bagalkot, India*	58
14:50-15:00	Questions & Answers	
15:00-15:30	Coffee/Tea Break	
15:30-15:45	**Preliminary evaluation of resistance to powdery mildew (*Podosphaera x anthii*) in AVRDC collections of bitter gourd (*Momordica charantia* L.)** Narinder P.S. Dhillon *AVRDC - The World Vegetable Center, Thailand*	59

15:45-16:00	**Induction of powdery mildew resistance in garden pea (*Pisum sativum*) using mutagenesis** Akhilesh Sharma *Department of Vegetable Science and Floriculture, CSK Himachal Pradesh Agricultural University, Palampur, India*	60
16:00-16:15	**Seeds and insecurity, reducing Malaysia's dependence on seed importation** Aaron Thomas Myatt *Crops for the Future Research Centre(CFFRC), Selangor, Malaysia*	61
16:15-16:30	Questions & Answers	
16:30 -16:45	**Development of squash varieties (*Curcubita moschata* Duchesne) for organic production system** Rodel G. Maghirang *Crop Science Cluster - Institute of Plant Breeding, College of Agriculture, University of the Philippines Los Baños, Laguna, Philippines*	62
16:45 -17:00	**Collection, evaluation and conservation of amaranthus germplasm** M. Padma *Vegetable Research Station, Dr. Y.S.R Horticultural University, Hyderabad, India*	63
17.00-17.15	**Genetic diversity studies in paprika germplasm (*Capsicum annuum* L.)** Boga Neeraja Prabhakar *Acharya N. G. Ranga Agricultural University, India*	64
17:15-17:30	Questions & Answers	
19:00-21:00	**Welcome Dinner**	

Session 2: From Seed to Harvest

Parallel session 2b: Sustainable production

Venue: ***Ladprao 2***

Chair: Mohamad Roff Mohd. Noor
Pest and Diseases Management Division
Malaysian Agricultural Research and Development Institute (MARDI)
Serdang Selangor, Malaysia

13:00-13:20	**Session Opening Speech** **Food and nutrition security related to vegetable production in Laos and future perspectives of Lao PDR, the Particular case in Vientiane Municipality** Linkham Douangsavanh *Deputy Director General* *National Agriculture and Forestry Research Institute (NAFRI),* *Ministry of Agriculture and Forestry, Vientiane, Lao PDR*	66
13:20-13:35	**Integrating biopesticides with chemical pesticides to manage legume pod borer (*Maruca vitrata*) on yard-long bean in Lao PDR and Vietnam** Srinivasan Ramasamy *AVRDC – The World Vegetable Center, Shanhua, Tainan, Taiwan*	67
13:35-13:50	**Year round vegetables production and quick growing fruit trees in home stead** Khan ASM MR *On-Farm Research Division, Bari, Gazipur, Bangladesh*	68
13:50-14:05	Questions & Answers	
14:05-14:20	**Pilot experiences of area-wide promotion and adoption of fruit fly Integrated Pest Management Farmer Field Schools in lower Mekong River Basin countries** Prabhat Kumar *Asian Center of Innovation for Sustainable Agriculture Intensification (ACISAI) , Asian Institute of Technology, Pathum Thani Thailand*	69
14:20-14:35	**Effect of organic matter application, conservative tillage and reduced chemical fertilizer use on vegetable yield and soil organic carbon content on a volcanic ash soil in west Java, Indonesia** Tomohide Sugino *Japan International Research Center for Agricultural Sciences, Tsukuba, Jap an*	70
14:35-14:50	**Production and utilization of organic inputs using beneficial microorganisms** Gloria Y. Ponciano *Tarlac College of Agriculture, Romulo, Camiling, Philippines*	71
14:50-15:00	Questions & Answers	
15:00-15:30	Coffee/Tea Break	
15:30-15:45	**Adoption, yield and profitability of tomato grafting technique in Vietnam** Christian A. Genova II *Consultant, ICF-GHK CONSULTING, Rebel Group, Philippines*	72
15:45-16:00	**Effect of trichoderma on horticultural crop cultivation** Ika Okhtora Angelia *Politeknik Gorontalo Jalan Sapta Marga Desa Panggulo Barat Kecamatan, Indonesia*	73

16:00-16:15	**Substitution of chemical fertilizer with vermicompost and its influence on production potential of cabbage (*Brassica oleracea L.* var. *capitata*)** Chinanshuk Ghosh *Agricultural and Food Engineering Department, Indian Institute of Technology Kharagpur, India*	74
16:15-16:30	Questions & Answers	
16:30-16:45	**Biological control agent (*Metarhizium anisopliae*) against flea beetles on pechay** Eusebia R. Pagluanan *Abra State Institute of Sciences and Technology Main Campus, Philippines*	75
16:45-17:00	**Yield and quality parameters of Bydagi chilli as influenced by nitrogen substitution and bio rational spray schedules** M. Shivaprasad *Department of Agronomy, University of Agricultural Sciences, Krishinagar, Karnataka India*	76
17:00-17:15	Questions & Answers	
19:00-21:00	**Welcome Dinner**	

Session 3: From Harvest to Table

Venue: ***Ladprao 3***

Chair: Gek Hoon Khoo
Director, Post-Harvest Technology Department
Agri-Food & Veterinary Authority

13:00-13:20	**Session Opening Speech:** **Linking vegetable growers to organized retail markets: the experience in India** P.G. Chengappa *National Professor of Indian Council of Agricultural Research (ICAR), Institute for Social and Economic Change, Bangalore, India*	78
13:20-13:35	**Participatory guarantee system (PGS) - the new way to achieve safe vegetables in farming context of Vietnam** Nguyen Thi Ha *Centre of Agrarian Systems Research and Development, Vietnam Agriculture Academic of Sciences, Ha Noi, Vietnam*	79
13:35-13:50	**Mapping vegetables - Understanding the food system of greater Bangkok, Thailand - A web-based collaborative research environment** Axel W. Drescher *Department of Environmental Social Sciences and Geography, University of Freiburg, Freiburg, Germany*	80
13:50-14:05	Questions & Answers	
14:05-14:20	**Farmer's market in developing and developed countries** Prem Nath *Former Assistant Director General, Food & Agriculture Organization (FAO)* *Chairperson, Vegetable Science International Network (VEGINET), Karnataka State, India*	81
14:20-14:35	**From harvest to table: Enabling informed nutrition choices and greater access to nutritious vegetables in southern Bangladesh** Richard Rose *International Development Enterprises (IDE), Dhaka, Bangladesh*	82
14:35-14:50	**Effectiveness of Ca-salts in reducing HCN content of Jack bean legume seed (*Canavalia ensiformis)* and its products** Arpah M *Department of Food Science & Technology, Bogor Agricultural University, Bogor, Indonesia*	83
14:50-15:00	Questions & Answers	
15:00-15:30	Coffee/Tea Break	
15:30-15:45	**Nutrient composition and sensory evaluation of drumstick (*Moringa oleifera*, Lam) leaf products** Bhuvaneswari G *College of Horticulture , University of Horticultural Sciences, Karnataka, India*	84
15:45-16:00	**Farm profitability and value chain management: Case study from India** K.C. Siva Balan *Department of Agricultural Extension and rural Sociology, AD AC & RI Trichy, Tamil Nadu, India*	85

16:00-16:15	**From harvest to table: Enabling higher value production in vegetable supply chains through market-based interventions in the coastal chars of southern Bangladesh** MD. Nurul Amin *International Development Enterprises (IDE), Dhaka, Bangladesh*	86
16:15-16:30	Questions & Answers	
16:30-16:45	**Survey and evaluation of tomato storage practices in Ilocos province, Philippines** Marissa I. Atis *Mariano Marcos State University, llocos Norte, Philippines*	87
16:45-17:00	**Characteristics and performance of tomato industry in Indonesia** Kuntoro Boga Andri *Assessment Institute for Agricultural Technology (BPTP), East Java, Indonesia*	88
17:00-17:15	Questions & Answers	
19:00-21:00	**Welcome Dinner**	

Session 4: Cross-sectoral issues

Venue: ***Ladprao 4***

Chair: Jintana Yhoung-Aree,
Institute of Nutrition, Mahidol University, Salaya, Nakhon Pathom, Thailand

13:00-13:20	**Session Opening Speech:** **Lessons learned from implementing nutrition-sensitive agriculture as a platform to improve nutrition and household food security** Nancy J. Haselow *Vice President Asia-Pacific, Helen Keller International, Asia Pacific Regional Office, Phnom Penh Cambodia*	90
13:20-13:35	**Building capacities and strengthening market integration of small-scale farming systems through a demand-driven approach to technology transfer** Stuart Morris *East-West Seed International Limited, Yangon, Myanmar*	91
13:35-13:50	**Plant factories** Mike Nichols *Massey University, New Zealand*	92
13:50-14:05	Questions & Answers	
14:05-14:20	**Research and development on vegetables and mushrooms project of Thailand Department of Agriculture** Grisana Linwattana *Horticulture Research Institute, Department of Agriculture, Bangkok, Thailand*	93
14:20-14:35	**Role of vegetables in rising food prices in India and its impact on the stakeholders** B. Singh *Indian Institute of Vegetable Research, Varanasi, India*	94
14:35-14:50	**The impact of new developments in small-scale vegetable production and marketing systems on food security and nutrition level of Sri Lanka** T.A. Dharmaratne *Hector Kobbekaduwa Agrarian Research and Training Institute, Colombo, Sri Lanka*	95
14:50-15:00	Questions & Answers	
15:00-15:30	Coffee/Tea Break	
15:30-15:45	**Improving vegetable small farm with marketing partnership** Sri Hery Susilowati *Indonesian Center for Agricultural Socio Economic and Policy Studies, Ministry of Agriculture, Bogor, Indonesia*	96
15:45-16:00	**Women in vegetable production: A way to empowerment** B. Singh *Indian Institute of Vegetable Research, Varanasi, India*	97
16:00-16:15	**Potential for diversity in tomato pigments for enhancing nutritive quality** Priyanka Biswas *Department of Vegetable Crops, Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India*	98
16:15-16:30	Questions & Answers	

26 February 2014 (Wednesday)

Session 1: Small-Scale Farming Systems

Venue: ***Grand Ballroom B***

Chair: Christian Genova II
Consultant, Agricultural Economics, Philippines

08:30-08:45	**An agronomic and economic study of rain shelter application for tomato production during hot season in East Java, Indonesia** Evy Latifah *Assessment Institute for Agricultural Technology (BPTP) East Java, Indonesia*	100
08.45-09.00	**Role of vegetables for solving the micronutrient deficiency (the hidden - hunger) in Bangladesh** Rahim MA *Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh*	101
09.00–09.15	Questions & Answers	
09.15–09.30	**Improving supply chain for high value vegetable in Indonesia: The case of vegetable production system by smallholders in East Java** Kuntoro Boga Andri *Assessment Institute for Agricultural Technology (BPTP) East Java, Indonesia*	102
09.30–09.45	**Economic and marketing of commercial vegetables in Barangay Banao, Bauko Mountain Province** Noel T. Depalog *Mountain Province State Polytechnic College, Bontoc, Philippines*	103
09.45–10.00	Questions & Answers	
10.00–10.30	Coffee/Tea Break	
10.30-10.45	**Establishment of model home garden targeting poor women household s and HIV victim members in per-urban area** Habtamu Nibret *Amhara Agricultural Research Institute, Adet Agricultural Research Center, Bahir Dar, Ethiopia*	104
10.45-11.00	**Studies in response of onion (*Allium cepa* L.) to various levels and sources of sulphur** S. Chattopadhya *Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India*	105
11.00–11.15	Questions & Answers	
12.00–13.30	Lunch break	

Session 2: From Seed to Harvest

Parallel session 2a: Germplasm and breeding

Venue: ***Ladprao 1***
Chair: Robert de la Peña
Head, R&D Operations and Product Development
East-West Seed International Ltd.

Session 2: From Seed to Harvest

Parallel session 2b: Sustainable production

Venue: ***Ladprao 2***

Chair: Mohamad Roff Mohd. Noor
Pest and Diseases Management Division, Malaysian Agricultural Research and Development Institute (MARDI), Serdang Selangor, Malaysia

Session 3: From Harvest to Table

Venue: ***Ladprao 3***

Chair: Gek Hoon Khoo
Director, Post-Harvest Technology Department
Agri-Food & Veterinary Authority

08:30-08:45	**Status of post-harvest losses and consumer level waste in vegetable supply chains in Asia: Their Impact on food security** Rosa S. Rolle *FAO Regional Office for Asia and the Pacific, Bangkok, Thailand*	124
08.45-09.00	**Improving the value chain and linking the market for vegetable growers in Bangladesh** Rahim M.A. *Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh*	125
09.00–09.15	Questions & Answers	
09.15–09.30	**Vegetables to go school in Southeast Asia and Africa: Training of Trainers Workshop design and implementation** Usha Palaniswamy *AVRDC - The World Vegetable Center, Shanhua, Tainan, Taiwan*	126
09.30–09.45	**Healthy diets for better nutrition** Nomindelger Bayasgalanbat *FAO Regional Office for Asia and the Pacific, Bangkok Thailand*	127
09.45–10.00	Questions & Answers	
10.00–10.30	Coffee/Tea Break	
10.30-10.45	**Selection of cassava (*Manihot esculenta* Crantz) accession and processing of leaf for use as a protein rich vegetable in Bangladesh** Fakir S.A. *Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh*	128
10.45-11.00	**Moringa - an indigenous high value vegetable crop can play a great role in nutrition and poverty alleviation in Bangladesh** Rahim M.A. *Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh*	129
11.00–11.15	Questions & Answers	
12.00–13.30	Lunch break	

Session 5: Enabling policies

Venue: ***Ladprao 4***

Chair: Grisana Linwattana,
Senior Research Scientist
Horticulture Research Institute, Department of Agriculture, Bangkok, Thailand

8:30- 08:50	**Session Opening Speech:** **Rural Bio-Resource Complex Project, a model integrated agricultural development leads to economic growth** K.C. Narayanaswamy *University of Agricultural Sciences, GKVK, Bangalore, India*	131
08.50-09.05	**Good agricultural practices for sustainable vegetable production in humid tropics** Nirmala Devi S *All India Coordinated Research Project (AICRP) on Vegetable Crops, College of Horticulture, Kerala Agricultural University, India*	132
09.05–09.20	Questions & Answers	
09.20–09.35	**Vegetable consumption at household level and its implication on vegetable farming development in Indonesia** Hadewi P. Saliem *Indonesian Center for Agricultural Socio Economic and Policy Studies, Bogor, Indonesia*	133
09.35–09.50	**Women's home gardens and food security: Evidence from Bangladesh** Pepijn Schreinemachers *AVRDC – The World Vegetable Center, Shanhua, Tainan, Taiwan*	134
09.50–10.00	Questions & Answers	
10.00–10.30	Coffee/Tea Break	
10.30-10.45	**Enhancing competitiveness of smallholder vegetable producers in the Southern Philippines: The role of local government** Luis Antonio Hualda *School of Management, Curtin University, Perth, Western Australia, Australia*	135
10.45-11.00	**Thai consumer valuation of food safety labels on fresh products** Rungsaran Wongprawmas *Department of Agricultural Sciences - Division Agricultural Economics and Appraisal, Alma Mater Studiorum-University of Bologna, Italy*	136
11.00–11.15	Questions & Answers	
11.15–11.30	**Growing forward: The potential of horticulture in the agriculture, rural and food policy adjustments of ASEAN Economic Community (AEC) member states** Patrick O'Reilly *Crops for the Future Research Centre(CFFRC), Selangor, Malaysia*	137
11.30–11.45	**Vegetable research and development in Central Luzon, Philippines** Quirino D. dela Cruz *Central Luzon State University, Nueva Ecija, Philippines*	138
11.45–12.00	Questions & Answers	

Side Event: Public and Private Sector Collaborations and Benefits for the Farmers

Asia & Pacific Seed Association (APSA) and AVRDC – The World Vegetable Center

Venue: ***To be announced***

Chair: Tom Burns
Director, Asia & Pacific Seed Association (APSA), Bangkok, Thailand

10:30-10:50 **AVRDC Tomato Yellow Leaf Curl Virus and Bacterial Wilt collaborations with the seed industry and seed distribution**
Peter Hanson
AVRDC – The World Vegetable Center, Shanhua, Tainan, Taiwan

10.50-11.10 **Bacterial Wilt resistances from AVRDC, use in seed industry and some rough figures on value added and significance of those resistances in the market**
Simon Jan De Hoop
East West Seed International Limited, Bangkok, Thailand

11.10–11.30 **Use of TY material from AVRDC by the seed industry**
Narendra Singh
Research Director Asia, HM-Clause

11.30–12.00 **Panel discussion on collaborations between public and private sector**

12.00–13.30 Lunch break

Poster Session

Venue: ***To be announced***

13:30-14:30 **Poster Session**
Poster presenters are responsible will be required to stand next to their poster to answer questions.

14:30-15:00 Coffee/Tea Break

Closing Session (Plenary)

Venue: Grand Ballroom B

15:00- 15:20 **The Global Horticulture Initiative – Challenges and prospects for Southeast Asia** 140
Detlef Virchow
Executive Secretary, Global Horticulture Initiative (GlobalHort), Bonn, Germany

15.20-15.40 **The Indian vegetable research programme and its application in Asia** 141
N.K. Krishna Kumar
Deputy Director General (Horticulture), Indian Council of Agricultural Research,New Delhi, India

15.40–16.00 **Scaling up technologies for small scale vegetable farming systems in Southeast Asia** 142
Gary Jahn
Agricultural Development Officer, United States Agency for International Development (USAID), Bureau for Food Security, Office of Agricultural Resea rch and Policy, Washington D.C.

16.00–16.45 **Roundtable Colloquium:**

SEAVEG 2014: Recommendations for policy makers, civil society and private business sector, farmers, and research and development organizations

- Hiroyuki Konuma, *Assistant Director-General and Regional Representative FAO Regional Office for Asia and the Pacific*
- Jacqueline Hughes, *Deputy Director General - Research, AVRDC – The World Vegetable Center*
- Joost Pekelharing*, President of East West Seed Group, East West Seed International limited*
- Prem Nath, *Chairperson, Vegetable Science International Network (VEGINET)*
- Suwit Chaikiattiyos, *Deputy Director General, Department of Agriculture*
- Nancy J. Haselow*, Vice President Asia-Pacific, Helen Keller International,*
- Detlef Virchow, *Executive Secretary, Global Horticulture Initiative (GlobalHort)*
- N.K. Krishna Kumar*, Deputy Director General (Horticulture), Indian Council of Agricultural Research*
- Gary Jahn, *Agricultural Development Officer,* United States Agency for International Development (USAID), Bureau for Food Security

Moderator
Robert J Holmer
Regional Director East and Southeast Asia, AVRDC – The World Vegetable Center

16.45–17.30 **Plenary discussion on symposium recommendations**

17.30–17.50 **Best oral paper award and Best poster award**

17.50–18.00 **Closing remarks**
Robert J. Holmer
Regional Director, AVRDC East and Southeast Asia

Masters of Ceremony:
Sheila Aclo de Lima
Administrative and Training Officer, AVRDC – The World Vegetable Center, Bangkok, Thailand
Orathai Wongmetha
Department of Agriculture, Bangkok, Thailand

27 February 2014 (Thursday)

Field trip

08:00	**Departure** Hotel Lobby
10:00	**Arrival** Kasetsart University Kampanngsaen Campus
11:30	**Departure**
12:00	**Lunch break**
13:30	**Departure**
14:00	**Arrival** East West Seed International Limited (Hortigenetics Research, S.E. Asia, Limited) 33 M. 4 T. Nongbo, Songpenong, Suphanburi 72190
16:30	**Departure**
17:30	**Arrival at Hotel**

More details about the field trip will be provided in a separate document

Opening Session (Plenary)

25 February 2014 (Tuesday)

Southeast Asian vegetable production – A vision for the next 40 years to bring prosperity to the poor and health for all

Hughes, J. d'A. and Keatinge J.D.H.
AVRDC – THE WORLD VEGETABLE CENTER, PO BOX 42, SHANHUA, TAINAN 74199, TAIWAN
jackie.hughes@worldveg.org

Holmer RJ
AVRDC – THE WORLD VEGETABLE CENTER, EAST AND SOUTHEAST ASIA, BANGKOK THAILAND

ABSTRACT

Global production of common and traditional vegetables is steadily increasing, and traditional vegetables in particular are attracting the attention of farmers, researchers, policy makers and the public. Nonetheless, many factors constrain vegetable production, including climate change and extreme climatic events, increased urbanization and pressure on arable land, ever-present pests and diseases, an aging farming population, and adverse policies toward horticulture. Families must have year-round access to affordable and nutritious food for a balanced, healthy diet, which must include vegetables as a source of many micronutrients. Southeast Asia must maximize crop productivity while minimizing losses, wastage and the overall impact on the environment. Solutions to improve productivity, profitability, and human nutrition include expansion and mechanization of protected agriculture, better production and environmentally-sensitive management technologies, investment in research to support traditional vegetables, improving all elements along the vegetable value chain, better engagement of the private sector (including postharvest value addition, food preservation technologies, and more efficient marketing performance), better information flow and management, and improved business skills, particularly for small-scale growers, distributors and marketers. Future initiatives to increase production must also emphasize consumer education to raise awareness about the value of vegetables for a well-balanced, healthy diet for all family members.

The role of private seed companies in the development of small scale farming systems

Pekelharing J
EAST WEST SEED INTERNATINAL LIMITED,BANGKOK, THAILAND
francine.sayoc@eastwestseed.com

ABSTRACT

There have been many improvements in vegetable farming and technology in recent time, which have vastly contributed to increasing farmer's income. Among these are improved seed varieties that have considerably increased the labor and land productivity in vegetable production. (Eaton and Wiersinga, 2009) There are, however, major barriers to adopting quality seed: rural poverty, lack of knowledge on inputs, poor cultivation techniques, and weak functioning of value chains.

As such, high quality seed alone does not ensure higher income and productivity. In an environment where majority of farmers have little or no access to information, agricultural extension has been identified as a precondition for opening and sustaining markets.

The private sector is in a position to play a key role in developing small-scale farming systems. (Sjauw-Koen-Fa, 2012) Apart from investing in R&D to develop better products, many seed companies are active in extending knowledge to farmers.

The contribution of private seed companies to the industry can thus be seen as two-fold: 1) to support the continuous improvement of vegetable varieties by investing heavily in R&D and innovation, and 2) to improve the profitability of vegetable production for small-scale farmers by promoting improved market-focused production techniques. Together, these create opportunities for wealth creation among small-scale vegetable farmers, and transform them into dynamic actors in the value chain.

The experience of East-West Seed, a private vegetable seed company focused on developing better tropical vegetable varieties, demonstrates that incorporating extension/advisory services is a fundamental long-term business strategy.

East-West Seed was one of the first private companies to introduce hybrid vegetable seeds in tropical Asia. Since the 80s, it has focused on variety development, seed production and the distribution channel. In addition to developing good genetics, it also focuses on equipping farmers with technical and managerial capability for vegetable farming under a tropical climate. Over the last three decades, extension services have improved the profitability of vegetable production for farmers by promoting access to technical know-how, developing embedded services and improving the availability and choice of inputs.

By developing improved varieties and promoting knowledge and better farming practices, private seed companies can contribute significantly to developing small-scale farming and a sustainable food strategy.

Vegetable production in Asia: Innovation, involvement, income and impact

Dasgupta S
FAO REGIONAL OFFICE FOR ASIA AND THE PACIFIC, BANGKOK THAILAND
subash.dasgupta@fao.org

ABSTRACT

Vegetables are an important non-staple food for all of us and provide unique nutritious elements in our diets. The FAO projections of food demand indicates that demand for pulses, potatoes, oilseeds and fruits & vegetables is projected to grow more rapidly than demand for cereals, and FAO land use projections rely on greatly accelerated yield growth for many of these secondary crops. The sector is constrained by widespread fragmentation in the supply chain, low productivity levels, and huge post harvest losses arising out of inadequate storage, cold chain and transport infrastructure, logistics and supply chain management.

Asia should demonstrate that they can produce clean, safe and nutritious food from a clean environment. The Asian region is where prospects will be the greatest. Achieving high quality levels is essential for continued growth of domestic vegetable consumption and gaining a competitive advantage in export markets.

Vegetable production systems can be broadly categorized into five groups: a. Homestead vegetable production and wild collection system; b. Vegetable production systems in the crop field adjacent to homestead areas; c. Vegetable production systems in rice growing fields; d. Peri-urban vegetable production system and e. Urban vegetable production systems.

Simultaneous efforts both in terms of policy direction and technology development and adoption are required for all five production systems to ensuring vibrant and sustainable development in this sector. Sustainable crop production intensification by adopting “Save and Grow” approach could be a viable option to grow safe and quality vegetables under all five production systems. Innovation, involvement, income and impact will determine future contribution of vegetables in achieving food and nutrition security of the millions of people of this region.

Session 1: Small-Scale Farming Systems

25 February 2014 (Tuesday)

The CGIAR research program on integrated systems for the humid tropics in Southeast Asia

Afari-Sefa V
AVRDC – THE WORLD VEGETABLE CENTER REGIONAL CENTER FOR AFRICA, ARUSHA,TANZANIA
victor.afari-sefa@worldveg.org

Schreinemachers P
AVRDC – THE WORLD VEGETABLE CENTER, PO BOX 42, SHANHUA, TAINAN 74199, TAIWAN
pepijn.schreinemachers@worldveg.org

Wang J.F.
AVRDC – THE WORLD VEGETABLE CENTER, PO BOX 42, SHANHUA, TAINAN 74199, TAIWAN
jaw-fen.wang@worldveg.org

ABSTRACT

With 2.9 billion people on about 3 billion hectares of land, the tropical humid areas of the world are critical to global food supplies and central to the maintenance of global biodiversity. Intensification of agricultural systems in these areas offers the potential for improving the incomes and nutrition of poor people, especially women and other vulnerable groups. Yet the humid tropics are prone to rapid resource degradation such as soil degradation, depletion of water sources and loss of biodiversity.

To address the challenges to sustainable agricultural intensification in the humid tropics, the Consultative Group on International Agricultural Research (CGIAR) has initiated a large international research program, called Humidtropics. It is one of 15 CGIAR Research Programs designed to address major global agricultural development challenges. But it is only one of three such programs that have adopted a systems-oriented perspective to focus on challenges typically facing resource poor households. Humidtropics is a global initiative, working in tropical Africa, Asia and the Americas. Its vision is to develop agricultural innovations that integrate increased productivity, improved institutions and market performance, and sustainable management of the natural resource base. The program is led by the International Institute of Tropical Agriculture (IITA) and implemented in collaboration with 11 primary partner international agricultural and advanced research institutions including AVRDC – The World Vegetable Center and hundreds of other local partner organizations at various Action Areas across the globe.

In Asia, Humidtropics has so far focused on the Central Mekong region, including parts of Cambodia, Laos, Myanmar, Thailand, Vietnam and Yunnan province (China). This is a very dynamic and diverse region, with marked contrasts in topography, farming systems, markets, people and institutions. Although the region is currently experiencing rapid economic growth and has lifted millions of people out of poverty, there is much uncertainty associated with the complex interplay of the major drivers of change, all of which have impacts on agriculture, land use, and natural ecosystems, particularly in upland areas.

The program has taken a bottom-up approach to identify priorities for research and development. It has a strong focus on gender, as women generally play a key role in the smallholder production systems that characterize the humid tropics, but generally exert too little control over resources. It also has a strong focus on innovation processes and aims to be inclusive in all its research and development activities. This inclusiveness offers plenty of opportunities for various research organizations to link their research with Humidtropics and to form effective partnerships with the international research centers and beyond. Together with other partners and stakeholders, AVRDC is currently committed to contributing to the specific integrated research thrust on sustainable intensified food, multi-crop and horticultural systems. Emphasis is being placed on research that allows farm families to feed themselves, get an income, and ensure that the land is still productive for future generations.

Healthier families, wealthier farmers: Vegetable growing benefit to indigenous peoples in Northeastern Cambodia

Schubert A
PROJECT MANAGER ANNÂDYA, RATANAKIRI, CAMBODIA
annick.schubert@gmail.com

ABSTRACT

Small-scale farmers in Ratanakiri (North-Eastern Cambodia) have recently started to grow vegetable in organic home gardens in the framework of Annâdya, a development project funded by the European Union1 to improve Indigenous Peoples' food security.

This study intends to identify benefits of vegetable growing in terms of nutrition and income-generating source for this marginalized population, who usually remains highly dependent on forest resources that are known to be dramatically declining. Among participating farmers, we observed that over 90% of families consume the vegetable they are growing. Thereby, farmers increase significantly the family weekly intake of fresh vegetable during the dry season, when wild vegetable become scarce in surrounding forests. But nutritional benefits extend further producers circle. Indeed, half of the participating farmers tend to offer vegetable they produce to family members and other neighbors. Finally, more than 20% of them were also able, out of their own initiative, to produce a surplus they could sell to neighbors and local markets. Health benefits are therefore obvious in this remote borderline region, intensively supplied by imported vegetable that, likewise some inland products, are said by local consumers to be non-compliant with food safety regulations. From the economic point of view, this activity can also be profitable as, on average, farmers could make an income of about 200 USD. This amount of money currently equals the average monthly income of rural population in Cambodia. Last but not the least; vegetable trade is also mainly managed by women locally. In a region where about 70% of adults have not completed primary education, and where women represents the biggest share of illiteracy, such activity helps reducing gender inequalities.

These results can be used by other development initiatives in order to improve nutrition of marginalized population and empower vulnerable women.

Evaluation of xiao bai cal (*Brassica chinensis*) varieties for cultivation in Singapore

Fong SL , Chen YL and Poh BL
HORTICULTURE TECHNOLOGY DEPARTMENT,AGRI-FOOD & VETERINARY AUTHORITY OF SINGAPORE
fong_siew_lee@ava.gov.sg

ABSTRACT

Trials were conducted at Sembawang Research Station, Agri-Food & Veterinary Authority of Singapore and on farms to identify xiao bai cai (*Brassica chinensis*) vegetable varieties that have high yields or are fast growing in local tropical climate, and that can be introduced to local farmers to improve farm productivity. Growth parameters including plant length, leaf length, leaf width, number of leaves, chlorophyll SPAD reading, plant weight and biological yield were evaluated. Eight varieties of xiao bai cai from commercial sources were evaluated. Three varieties were further tested by two farms and another two varieties were found to have comparable yields and marketability to the standard variety.

Effect of drip irrigation and mulching on yield, water use efficiency and economics of tomato

Biswas S.K. , Akanda M.A.R. , Rahman M.S.
IRRIGATION AND WATER MANAGEMENT DIVISION,BANGLADESH AGRICULTURAL RESERCH INSITTURE, BANGLADESH
sujitbari@yahoo.com

ABSTRACT

With the increasing scarcity of water for agriculture in many regions, drip irrigation is gaining popularity for its precise and efficient use of water. Field experiments were conducted at the experimental field of Bangladesh Agricultural Research Institute (BARI), Gazipur, Bangladesh during the winter seasons (November to March) of 2007 - 2008 and 2008 - 2009 to study the combined effects of drip irrigation and mulches on yield, water use efficiency and economic return of tomato. The treatments of the experiment comprised different combinations of three drip irrigation levels (100, 75 and 50% of the irrigation requirement) and two mulches (black polyethylene sheet and paddy straw). Irrigation requirement was estimated from actual evapotranspiration by using Penman - Monteith's equation. The average seasonal water requirement for tomato was estimated to be 294 millimeter. The yield and yield-contributing characters in the mulched treatments for all levels of irrigation were significantly higher compared to those in the unmulched treatments. The yield of tomato increased with the increasing amount of irrigation water when there was no mulch. The trend of variation of the yield was reversed when drip irrigation was coupled with the two mulches. The highest yield for each mulch was obtained when 50% of the water requirement was applied: 81.12 ton/ha for polyethylene mulch and 79.49 ton/ha for straw mulch. With 100% water application, polyethylene-mulched treatment produced lower yield than the straw-mulched treatment. The highest water use efficiency of 572 kg hamm with a 53% saving in irrigation water was observed in the treatment with 100% water application coupled with the polyethylene mulch. The highest net return, incremental net return, and incremental benefit-cost ratio were found for 50% water application with straw mulch. The study reveals that drip irrigation and mulch have an explicit role in increasing the productivity of tomato.

Quality vegetable production through fertigation system

RAZZAQUE A. A.
IRRIGATION AND WATER MANAGEMENT DIVISION, BANGLADESH AGRICULTURAL RESEARCH INSTITUTE, GAZIPUR, BANGLADESH
razzaquebari@gmail.com

ABSTRACT

Fertigation is the process of application of soluble fertilizers/nutrients to plants with irrigation water through drip system. Benefits of fertigation over traditional broadcast or drip fertilizing methods are; Increased nutrients absorption by plants, Reduction in fertilizer and chemicals needed, Reduced leaching to the water table, Reduction in water usages due to plants resulting increased root mass's ability to trap and hold water and Application of nutrients at the precise time they are needed and at the rate they are utilized.

This technology is being practiced in many countries of the world. But it is new in Bangladesh. Irrigation and Water Management Division of Bangladesh Agricultural Research Institute (BARI) has been working with fertigation on high value vegetable crops, like, brinjal, winter & summer tomato, capsicum etc along with strawberry and papaya under controlled environment for producing quality vegetables and fruits since 2001-2002. The performance of fertigation has also been studied in saline areas of Bangladesh where fresh water availability is very limited for producing watermelon, cucumber and tomato. Nearly 28-31% increased quality yield was achieved through fertigation over the traditional methods. The quality of vegetable/fruits are comparatively better than that of traditional methods. It also saves 48-50% of irrigation water, 55-58% of Nitrogen and 35-38% of potash fertilizers. The water productivities ranged from 16.2-18.4 kg/m3 for different crops using this system. The BCR was found 3.8-4.6 for different crops in this system. This technology was found technically and economically suitable for all areas along with drought and saline prone areas. This technology is now being popularized among the farmers in drought prone areas of North-West of Bangladesh by the department of Agriculture Extension (DAE) and different NGO'S. Now, the large farmers and private entrepreneurs are using this technology for producing high value crops.

Growth and yield of corn as affected by different row intercropping patterns with indeterminate tomato in southeastern Ifugao, Philippines

Medina L. C.
RESEARCH AND DEVELOPMENT UNIT, IFUGAO STATE UNIVERSITY, IFUGAO, PHILIPPINES
mayumi _1327@ yahoo.com

Pimental B. A.
COLLEGE OF AGRICULTURE AND FORESTRY, IFUGAO STATE UNIVERSITY, IFUGAO, PHILIPPINES

ABSTRACT

Southeastern Ifugao, Philippines had been into mono-cropping for several years which resulted to soil degradation, environmental pollution and decreased yield. The rapid population growth rate also caused a decrease in the economic family size farm unit. Indeterminate tomato intercrop has been shown to provide extra income for subsistence corn farmers. The leaf toxin content and growth habit of indeterminate tomato could help reduce corn borer infestations resulting to increased yield. This study aimed to determine the effect of indeterminate tomato as row intercrops on the growth and yield of corn. The Randomized Complete Block Design (RCBD) with four treatments replicated three times: T0 -, corn without tomato intercrops, T1 - two rows of corn and one row of tomato, T2 - three rows of corn and two rows of tomato, and T3 - four rows of corn and three rows of tomato, were used in this study. Results showed that T2 obtained the least number of corn borer-damaged plants of 9.16 plants per treatment, followed by T1, T3 and T0 resulting to more corn borer-damaged plants with their respective means of 10.54, 12.5 and 17.64 damaged plants per treatment. As to corn yield, T0 outyielded T1, T2 and T3. However, in terms of the combined yield of corn and tomato, higher income was realized per unit area with T2 producing the highest returns on investment (ROI) followed by T3, T1 and T0 with their corresponding ROI of 218.26, 183.74, 179.68 and 41.83, respectively. Based on the results of this study, to increase yield and income, T2 is recommended to corn farmers with limited sized farms.

Integrated homestead farming and nutrition: Bangladesh experience

Bhattacharjee L and Roboson M
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, BANGLADESH
lalita.bhattacharjee@fao.org

ABSTRACT

Integrated homestead farming systems linked with nutrition education programmes are one of the keys to improving the diets and nutrition of rural communities. Programmes implemented in the south and central Bangladesh supported by FAO provides a case for promoting a nutrition orientation to agriculture programmes and policies with support for nutrition sensitive approaches. A decade of efforts in creating an environment of food production for consumption and equipping the rural farmers with the knowledge, technology and skills to prepare and process nutritious foods and recipes for yearlong availability, income and household consumption is pointing towards dietary diversity and better nutrition

Training in nutrition and food processing at national, sub national and community levels were provided as part of the technical support to the participating communities. End line surveys showed a fourfold increase in the participating households in where integrated homestead gardens were introduced. Over ¾ of women participated in the home garden's courtyard nutrition education sessions. Food consumption scores were found to increase by 87% among participating households and food consumption patterns indicated more diverse and healthier diets compared to the baseline. Women in the programme areas had higher knowledge and reported changes in infant and young child feeding practices. Prevalence of acute malnutrition declined with the community based therapeutic feeding and one-to- one counseling of mothers in the home garden courtyard session on using nutritious recipes for the recovering children. Increased production and consumption of local fish, fruits and vegetables not only improved the micronutrient intake, but also increased women's potential to take household decisions, earn additional income from selling surpluses since local foods are mostly grown or gathered by women. Within the context of a sustainable food based approach, the food and health sectors are promoting home based complementary foods and nutritious recipes for improving diets of children and their households.

Food and agriculture policies need to be nutrition sensitive and explicitly promote integrated homestead farming and incorporate nutrition criteria to increase access of the poor to nutritious foods and impact on sustainable diets. Lessons learned show that in order to be effective, the programmes must be adopted at national level and implemented in the community.

Optimizing homeyard spaces for integrated vegetable production: A case study of Bali, Indonesia

Surawan I. B
BALI ASSESSMENT INSTITUTE FOR AGRICULTURAL TECHNOLOGY, DENPASAR, BALI, INDONESIA
ibgsuryawan@hotmail.com

ABSTRACT

Securing food availability in Indonesia requires a sustainable food production growth of more than 2% per year. Meanwhile, home yard area that is currently available nationwide is about 10.3 million ha or 14% of the total area of agricultural land . However, people have not optimally exploited their home yard to supply nutritious food for their family. Accordingly, optimizing available spaces in home yard is one solution that can help solve the food security problem. This study aimed to (1) optimize home yard spaces to integrate vegetables, livestock, and fish; (2) enhance skill of people, especially women, on home yard agricultural production; (3) increase healthy food consumptions indicated by expected food pattern value (EFP); and (4) reduce expenses for family's daily needs, especially on food. The study has been conducted during 2012 in Bali Province, spread in 8 regencies and more than 800 women/families participated as cooperators. Study was conducted in three different subjects, i.e. training on organic cultural practices, demonstration plots, and home nursery management.

Results of this study showed that commodity groups cultivated by families (cooperators) were about 25 kinds (species and/or varieties) of vegetables, eight kinds of food crops, nine kinds of fruits, 25 kinds of medicinal and spice crops, four kinds of livestock, and one species of fish. Number and kind of crops planted in each house varied, ranging from three kinds to more than 20 kinds of crops. Half of the families planted 5-10 kinds of crops, about 34% planted less than 5 kinds, and the rest planted greater than 10 kinds. People in the community consumed about 17 kinds of vegetables, three types of which were consumed every day, whereas the others were consumed 1-3 times a week. Economic impact of the activities showed family daily savings between Rp. 5,000 - Rp. 20.000/day/family or equivalent to Rp. 150,000 - Rp. 600,000 (about US $15 - $60) per month. The expected food pattern value was 82.24, which was higher by 19.46 before optimizing the use of home yard spaces. These results indicated that optimizing home yard use resulted to significant family daily savings on food expenses, easy access to healthier food, and more proportional food composition (indicated by greater EFP value).

Keywords

home yard, integrated vegetable production, food security

Trained Master Gardeners Promoting Vegetable Production in Urban Households and Schools

Kumar L.A.
REGIONAL HORTICULTURE SPECIALIST, UNIVERSITY OF MISSOURI EXTENSION, MISSOURI , USA
kumarl@missouri.edu

ABSTRACT

The Master Gardener of Greater Kansas City is a University of Missouri Extension program serving Jackson, Clay, Platte and Cass Counties of Missouri, USA. The Master Gardener program is a popular volunteer program throughout the United States and Canada. The Master Gardener Program was started to meet a high demand of urban horticulture and gardening advice. Thousands of people across the United States have been trained as Master Gardener volunteers. It is a two- part educational effort, in which gardeners are provided many hours of in-depth horticulture training, and in return they help local university extension agents through volunteerism. Master Gardeners assist with garden lectures, exhibits, demonstrations, school and community gardening, phone diagnostic service, research, and many other projects in urban and suburban areas.

During the last few years the demand for information and skills on vegetable production in urban households and public schools has increased considerably due to the increase interest in local healthy food. The Master Gardeners are increasingly involved with Kansas City midtown and downtown residents, especially among the minority population and public schools. The part of Kansas City midtown and downtown areas are designated as food deserts, because these areas are devoid of grocery stores and quality foods, including fresh vegetables and fruits at affordable prices. With the help of vegetable demonstration gardens, community gardens and school gardens Master Gardeners are promoting small scale home and school vegetable production for consumption.

Through this presentation the author will not only share the work of Master Gardeners in promoting home and school vegetable production, but also provide background information on the Master Gardener Program of Greater Kansas City for the benefit of the international audience.

Growth and yield of pechay (*Brassica chinensis*) applied with different rates of vermicast

Edwin S.A.
ABRA STATE INSTITUTE OF SCIENCES AND TECHNOLOGY MAIN CAMPUS, PHILIPPINES
erpagluanan@yahoo.com

ABSTRACT

Brassica chinensis is a popular leafy vegetable grown in the locality for its tender and succulent leaves. It can be grown also in small scale in a backyard garden. Pechay production is an agricultural enterprise, which is easy to grow. It can be grown with minimal inputs because of its short growth duration. The study aimed to find out which application of vermicast would give the fastest growth of pechay, to determine which application of vermicast would give the highest yield and to determine which rate of application of vermicast would give the highest income.

The area was divided into four blocks. Each block was further subdivided into four plots representing the treatments following the RCBD. The different rates of vermicast used in this study were: treatment T1-4 bags 14-14-14 and 2 bags urea/ha (Farmer's Practice), T2-440 kg/ha, T3-600 kg/ha, and T4-800 kg/ha vermicast.

Highly significant differences on weekly growth of pechay, final height, and weight of marketable plants and total yield were observed among treatments. Moreover, highly significant differences on growth increment as seen in and final height were observed on the different rates of vermicast fertilizer applied to pechay. Plants applied with inorganic fertilizer (Farmer's Practice) were the tallest.

There were highly significant differences observed on the weight of pechay per treatment as shown in and the yield per treatment. The plants subjected to farmer's practice of fertilizer application registered the heaviest weight among the different treatments as compared to those plants applied with different rates of vermicast fertilizer although the different rates did not differ significantly from each other. This implies that the lowest rates of vermicast fertilizer could be used in the production of organic pechay for better health of the consumer.

The best rate of vermicast application for pechay production is 400 kg/ha. The use of this rate lowers the inputs on fertilizer as compared with the use of inorganic fertilizer which is also hazardous to human health. It gave an ROI of 92.41% which is also feasible than using inorganic fertilizer that needs more inputs.

Indigenous vegetables, fishes and shells integrated in the native rice farming system in the province of Ifugao

Allig T.D. and Bustamante B.A.
EXTENSION AND TRAINING, IFUGAO STATE UNIVERSITY, IFUGAO , PHILIPPINES
tessieboncato@yahoo.com

ABSTRACT

The study was conducted from April 2010 to December 2011 at the province of Ifugao, Cordillera region, Philippines with the objectives of assessing the economic returns and food security from the integration of indigenous vegetables, shells and fish in the native rice farming system. The study made use of structured questionnaire and face to face interview with the farmers. Farm visit and documentation of the practice was used in the study. Data on the socioeconomic profile of farmers in the study sites was also gathered.

Result showed an average household number of 8 and consumed their rice harvest for an average of 7 months with an average income of P3,555.00/cropping from the rice produced.

Watercress planted after harvesting rice in the paddy showed an additional net income ranging from P1,000.00 to P1,600.00 per cropping depending on the prevailing price per bundle. An additional average of 20 bundles of water cress was not sold but use for home consumption. Snap beans planted in the dikes added a net income of P 100.00 to P120.00 while an average of 5 kilograms was used for home consumption. Pechay on the hand gave an additional income ranging from P 150.00 to 260.00 per cropping with an average of 10 bundles for home use. Additional vegetables like green onions, cabbage, garlic planted on organically grown "pinkol" added food for the family.

Integrating vegetables, fishes and shells in the rice farm has added income ranging from P 415.00 to P1,840 pesos per cropping giving a net income increase ranging from 23 to 58 %.

Session 2: From Seed to Harvest

Parallel session 2a: Germplasm and breeding

25 February 2014 (Tuesday)

Identifying objectives for breeding improved vegetable varieties-hard but vital choice

Nath P
FORMER ASSISTANT DIRECTOR GENERAL, FAO
CHAIRMAN, PREM NATH AGRICULTURAL SCIENCE FOUNDATION (PNASF), BANGALORE, INDIA
drpremnath@vsnl.net

ABSTRACT

The vegetable breeding experience confirms that identifying objectives of breeding is prelude and key to successful results of a breeding programme in developing improved varieties. In order to identify the objectives, the views of the choice makers must be considered which will ensure the acceptance and popularity among the farmers and consumers. Practical examples have been illustrated.

Genotype x environment interaction and stability analysis of yield and components traits in French bean (*Phaseolus vulgaris* L.)

Sharma A
DEPARTMENT OF VEGETABLE SCIENCE & FLORICULTUREK, CSK HIMACHAL PRADESH AGRICULTURAL UNIVERSITY, INDIA
assharmaakhill@gmail.com

ABSTRACT

Selection of stable and high yielding genotypes is important not only for increasing the agricultural production but also to use for the regular breeding programme. Twenty seven French bean genotypes were evaluated in three different agro-ecological zones of Himachal Pradesh comprising of four environments to study their stability in performance by following model of Eberhart and Russell (1966) during summer 2008 and 2009. Analysis of variance, means, regression co-efficient (bi) and deviation from regression (s2di) of the individual genotypes were estimated to evaluate the stable performance of the genotypes. The mean squares due to genotypes, environments and genotype-environment interaction were significant for most of the characters studied which suggests variability among the genotypes for various characters over the environments. Genotype × environment interaction was also found significant for majority of the traits. The stability analysis showed significance of linear component of variation for important traits including fresh pod and seed yield. On the basis of regression coefficient and mean values, the genotypes 'Arka Suvidha', 'DWDFB-1', 'DPDFB-1(M)', 'DPDFB-2(M)', 'IVRFV-1', 'IVFB-1', 'MFB-2' and 'MFB-3' showed stability below average (bi>1) for fresh pod yield which indicated their specific adoption to favourable environments. Genotypes 'DWDFB-53', 'MFB-4' and 'Aparna' were found to be desirable and stable for high fresh pod yield under unfavourable environments stability above (bi<1) average. Genotype 'MFB-2' was observed to be the most stable for seed yield per plant and days to seed maturity over the environments. Among others traits, genotypes 'DWDFB-1(M)' for average pod weight and 'DWDFB-1' for pods per plant showed stability above average indicating their adoption to unfavourable environments.

Screening for high beta carotene and lycopene in tomato

Siriyan R and Austin J
SISAKET HORTICULTURAL RESEARCH CENTER, SISAKET, THAILAND
noy_siriyan@hotmail.com

Sakuanrungsirikul S
KHON KAEN FIELD CROPS RESEARCH CENTER, KHON KAEN, THAILAND
suchirat1@yahoo.com

ABSTRACT

In recent years, beta carotene and lycopene has been widely available as dietary supplement and it include in a number of popular multivitamin formulations and health food products. They benefit by protecting oxidative damage of several human disease. These carotenoids are widely found in many fruits and vegetables. Beta carotene and lycopene are the most abundant pigments in ripe tomatoes. Tomato fruit samples were collected from various sources in the North and Northeast of Thailand. They were planted and selected for agricultural characteristics. Two hundred and forty three tomato samples were evaluated for high beta carotene and lycopene by spectrophotometric method. All tomato fruits were harvested at the red mature stage. Beta-carotene was extracted with a solution of hexane: ethanol: acetone (ratio 3: 1.5: 1.5). The absorbance was measured at 449 nm. Lycopene was extracted with a solution of hexane: ethanol: distilled water (ratio 5:3:1). The adsorption of hexane phrase was measured at 471 nm. There are three samples with high beta carotene. The samples are no.126-1 and no.229 in 3.49 and 3.30 mg/100 g fresh, respectively. The samples showed high lycopene are no.126-1, no.303 and no.337 in 10.70, 10.89 and 11.62 mg/100 g fresh. The best tomato sample is no.126-1 showed high beta carotene and lycopene. These number will be subjected further for a breeding program.

The selection of onion varieties in off-season production

Wongmetha O and Kutrakul S
CHIANG MAI ROYAL AGRICULTURAL RESEARCH CENTER, CHIANG MAI, THAILAND
agriculture_24@hotmail.com

Linwattana G
HORTICULTURE RESEARCH INSTITUTE, DEPARTMENT OF AGRICULTURE, BANGKOK, THAILAND
linwattana@chaiyo.com

Panuampai W and Kaneythipe J
CHIANG MAI AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER, CHIANG MAI, THAILAND

Sakuanrungsirikul S
KHON KAEN AGRICULTURAL PRODUCTION SCIENCE RESEARCH AND DEVELOPMENT CENTER, KHON KAEN, THAILAND

ABSTRACT

The selection on off-season onion for fresh consumption and processing was conducted at three locations in Chiang Mai and one location in Khon Kaen during 2012-2013. All experiments were laid out using a RCBD, four replications and ten treatments (nine varieties of the seed onion imported from Netherland; Cavalier F1, Sirius F1, Minerva F1, Buccaneer F1, Colossus F1, Annika F1, Sweet Uno F1, Lucinda F1 and Fernanda F1, and one variety of Thai farmers; Superex). The growth, physical characteristics, yield and quality attribute were recorded. The productivity of Fernanda F1, Colossus F1 and Buccaneer F1 varieties in all locations were higher than other varieties. The bulb shape of their varieties was different such as rhomboid, broad, blobe, broad elliptic and spindle shapes. The bulb width and length of Fernanda F1 and Colossus F1 was bigger than other varieties. Fleshy scale leave of all varieties were 5-8 scale leaves. The total soluble solid of Lucinda F1 and Minerva F1 was the highest when compared with other varieties. Further investigation on the selection of onion varieties in season, postharvest handling, the nutritional quality, satisfaction of farmer and consumer, and marketing acceptance should be conducted in the future.

Varietal evaluation, on-farm trials and seed production of organic vegetables in Central Luzon, Philippines

Manipon A.O.
CENTRAL LUZON STATE UNIVERSITY, SCIENCE CITY OF MUÑOZ, NUEVA ECIJA, PHILIPPINES
maniponarturo@yahoo.com

Dayag D.M.
AGRICULTURAL STATE COLLEGE, PINAOS, SAN ILDEFONSO, BULACAN, PHILIPPINES

De Jesus N.G.
PAMPANGA AGRICULTURAL COLLEGE, SAN AGUSTIN, MAGALANG, PAMPANGA, PHILIPPINES

Maghirang R.G.
INSTITUTE OF PLANT BREEDING, UNIVERSITY OF THE PHILIPPINES AT LOS BAÑOS, LAGUNA, PHILIPPINES

ABSTRACT

Nine tropical vegetable crops were identified and considered in this project namely: eggplant, okra, yardlong bean, squash, tomato, pechay, onion and melon. Each crop had five entries per variety and said entries were solicited and obtained from UPLB-IPB (University of the Philippine at Los Baños-Institute of Plant Breeding), land races from farmers of various localities of Central Luzon, and other research and breeding institutions in the Philippines based on high yield, acceptability on consumer, resistance to pests and diseases as well as in abiotic stresses.

The initial evaluation of such crop entries was conducted in 2 x 5 m plot size and was exposed to lesser application of cultural management and farm inputs and subjected to environmental stress including imposition of less irrigation. Crops that performed well under such stressed conditions were selected. During replicated yield trials, commercial varieties were used and planted along with the crop selections under organic gardens and imposed organic production systems. All selections that out yielded the yields or were at par with the yields of the commercial check were further evaluated both on station and at the farmer's field level.

To ensure high degree of acceptability of these varieties among target end-users participative selection was undertaken involving organic farmers. Also, a simple survey on the fruit appearance quality was undertaken involving not only organic vegetable growers but also traders and consumers as well. Such information was used as guide in the identification of crop varieties for further development of production and varietal management technologies.

Finally, there are at least three promising selections for each crop mentioned above and were seed produced and are ready to be released for use as organic vegetable seeds for Central Luzon, Philippines.

Performance studies of different oriental pickling melon (*Cucumis melo* var. Conomon) genotypes under northern dry zone of Karnataka

Ganiger V. M. , Bhuvaneswari G, Pallavi H. M. and Madalageri M. B.
COLLEGE OF HORTICULTURE UNIVERSITY OF HORTICULTURAL SCIENCES, BAGALKOT, KARNATAKA, INDIA
vasantg.veg@gmail.com

ABSTRACT

A study was carried out to know the performance for growth, yield and quality attributes of Oriental pickling melon (*Cucumis melo* Var. Conomon) in the College of Horticulture, University of Horticultural Sciences, Bagalkot, Karnataka, India. The experiment comprising of seventeen genotypes laid out in randomized block design replicated three times. The results of the studies indicated that there was a significant difference observed among the genotypes for growth, yield and quality parameters. Maximum vine length was recorded by the genotypes BCMCR-1 (154.50 cm) followed by BCMCO-4 (136.16 cm). The highest number of secondary and tertiary branches was recorded in Mangalore (9.00) and GR-2-1 (10.50), respectively. The next best genotypes were GR-1-1 (6.46) and BCMCG-03 (7.13) for secondary and tertiary branches, respectively. The results were significantly differing for all the growth parameters except number of leaves per vine. With respect to yield parameters, the highest average number of fruits (9.13/ plant) and average fruit weight (0.34 kg) was noticed in BCMCO-02. The next best genotype was BCMCO- 01 with average number of fruits 7.33 per plant and average fruit weight of 0.39 kg. Whereas, the maximum fruit yield was noticed in GR-3 (7.11 kg/plant and 55.68 t/ha) compared to all other genotypes.

Fruit characters (fruit length, breadth and shape) and quality parameters (flesh color, TSS and flesh thickness) revealed that maximum fruit length was noticed in Mudicode (25.55 cm) and Sirsi-1 (24.49 cm) while maximum fruit breadth was found in BCMCO-04 (14.96 cm) with ovate shape and Sirsi-1 (14.78 cm) with elliptical shape. The genotypes did not differ significantly with respect to flesh thickness. However, genotypes GR-2-2 (2.96 cm) and Mangalore (2.95 cm) were having more flesh than other genotypes. The high TSS content was observed in BCMSCO-1 and Mudicode (6.310 brix and 6.240 brix, respectively). Most of the genotypes were elliptical (41.18%) and globular (23.53%) in shape. The flesh color of genotypes varied from cream to white.

Preliminary evaluation of resistance to powdery mildew (*Podosphaera xanthii*) in AVRDC collections of bitter gourd (*Momordica charantia* L.)

Dhillon, N.P.S. , Phethin, S. and Wang J.F.
AVRDC – THE WORLD VEGETABLE CENTER, EAST AND SOUTHEAST ASIA, KASETSART UNIVERSITY, KAMPHAENG SAEN, NAKHON PATHOM 73140, THAILAND
narinder.dhillon@worldveg.org; supunsa.phethin@worldveg.org; jaw-fen.wang@worldveg.org

Chung-cheng L. and Chen W.
AVRDC – THE WORLD VEGETABLE CENTER, PO BOX 42, SHANHUA, TAINAN 74199, TAIWAN
chung-cheng.lin@worldveg.org

Kousik S.S.
U.S. VEGETABLE LABORATORY, 2700 SAVANNAH HIGHWAY, CHARLESTON, SC , USA

McCreight J.D.
U.S. DEPARTMENT OF AGRICULTURE, AGRICULTURAL RESEARCH SERVICE, U.S. AGRICULTURAL RESEARCH STATION, CA, USA

ABSTRACT

Bitter gourd (*Momordica charantia* L.) is an important market vegetable in Asia, where it is also used in folk medicine to manage type 2 diabetes. Powdery mildew caused by *Podosphaera xanthii* is a serious fungal disease of bitter gourd and yield losses of up to 50% have been reported. After observing the initial field reaction of 150 global collections of bitter gourd to *P. xanthii*, a powdery mildew field screening experiment comprising seven accessions (THMC 113, THMC 143, THMC 144, THMC 153, THMC 167, THMC 170, THMC 177) was conducted at AVRDC – The World Vegetable Center at Kasetsart University's Kamphaeng Saen campus in Nakhon Pathom, Thailand during the winter season of 2011. Five plants of each accession were evaluated in a non-replicated plot. Disease reaction was recorded for individual plants of each entry following a two-part rating scale where (S) indicated both sides of the leaves were covered with mildew mycelia and spores and (R) indicated leaves had no visible mildew. Five bitter gourd accessions (THMC 113, THMC 143, THMC 153, THMC 167, THMC 177) were resistant to the local race of powdery mildew. These accessions were also assessed at AVRDC headquarters in Taiwan during the spring season of 2012. Accessions THMC 143, THMC 153, THMC 167, and THMC 177 were highly resistant to the local race of powdery mildew. Accessions THMC 113, THMC 143, THMC 144, THMC 153, THMC 167, THMC 170, and THMC 177 were highly resistant to *P. xanthii* race SD in a greenhouse test in Salinas, California, U.S.A. The seven bitter gourd lines were also resistant to the powdery mildew isolate prevalent in Charleston, South Carolina, U.S.A (Melon Race 1) in greenhouse and field tests. However, when these lines were tested against a powdery mildew isolate collected from wild balsam apple (*Momordica charantia*) plants in Florida, AVRDC lines THMC 113 and THMC 170 were highly susceptible in a petri-plate assay. All other AVRDC bitter gourd lines evaluated were highly resistant and no powdery mildew was detected on their leaves.

Induction of powdery mildew resistance in garden pea (*Pisum sativum* L.) using mutagenesis

Sharma A , Singh Y , Katoch V and Chaudhary
DEPARTMENT OF VEGETABLE SCIENCE & FLORICULTUREK, CSK HIMACHAL PRADESH AGRICULTURAL UNIVERSITY, INDIA
assharmaakhill@gmail.com

Dhole V.J.
MOD LAB, NABTD, BHABA ATOMIC RESEARCH CENTRE, MUMBAI, INDIA

ABSTRACT

Physical and chemical mutagens were used to widen the genetic variability of pea (*Pisum sativum* L.) via experimental mutagenesis. A set of 5000 seeds of varieties 'Azad P-1' and 'Lincoln' was irradiated at 30, 40, 50 and 60 Gy. Simultaneously, another set of 2500 pre-soaked seeds of each cultivar was treated with 0.3% and 0.4% ethyl methane sulfonate (EMS) solution for 8 h at 30 ± 1 0C with intermittent shaking in a gyratory shaker. The treated seeds were thoroughly washed in running water for 8 h to leach out excess EMS. The M1 generation (both irradiated and EMS treated seeds) was raised in the field during November, 2011 at Palampur (mid hill humid temperate zone). All the surviving plants were harvested individually to obtain M2 generation. Plant-to-row progenies of individual M1 plants (M2 generation) were sown in the last week of May 2012 at High Hill Agricultural Research and Extension Centre, Kukumseri (high hill dry temperate zone) to select desirable powdery mildew resistant mutants. From the M2 generation, two putative mutant plants from mutagenized population of Lincoln at 50 Gy (L-50-1113-1) and 0.4% EMS (L-0.4-43-1) were obtained with powdery mildew disease reaction only on leaves while pods and stem remained free from powdery growth. In addition, agronomically superior plants for various traits were also selected in M2 generation. The individual harvested M3 plants were raised at Palampur during winter 2012-13. All 19 plants of mutant progeny L-50-1113-1 grown under poly house at Palampur showed similar reaction as at Kukumseri with traces of powdery growth on leaves only. In addition, four segregating progenies in M3 generation from agronomically superior plants were also identified for powdery mildew disease resistance. The segregating pattern of the novel PMR mutant lines showed that resistance is inherited by recessive genes.

Seeds and insecurity, reducing Malaysia's dependence on seed importation

Myatt A.T , Maqbool, M and O'Reilly, P
CROPS FOR THE FUTURE RESEARCH CENTRE, LEVEL 2 BLOCK B, THE UNIVERSITY OF NOTTINGHAM MALAYSIA CAMPUS , JALAN BROGA, SEMENYIH, SELANGOR, MALAYSIA
khby2ata@nottingham.edu.my; mehdi.maqbool@cffresearch.org; patrick.oreilly@cffresearch.org

ABSTRACT

With the National Key Economic Areas for Agriculture (2010), Malaysia has maintained its commitment to increasing land area for food production. Much focus has been given to rice self-sufficiency and the improvement of rice varieties. Meanwhile Malaysia remains a net importer of fresh vegetables and seed due to weak internal production. Difficulties in production are related to the restrictions Malaysia's climate places on some vegetables, limited superior local varieties and high production costs. Dependence on importation undermines the nutritional security of Malaysia's population because market fluctuations may leave some without access to fresh vegetables. In line with Malaysia's current agricultural commitments, more effort must be given to securing internal seed production as a foundation of self-sufficient vegetable production. Most seed is sourced from Thailand. Imported seeds are generally F1 cross-breeds adapted for tropical conditions. Malaysia's reliance on imported seed leaves it vulnerable to fluctuations of price, availability and type. Malaysia has yet to formalize mandatory a Seed Certification Schemes to protect plant breeder rights. This will likely be established with the planned Malaysian Seed Act in compliance with TRIPS Define (UN). Malaysia is in a position to adapt its legislation to meet the countries desire to become more self-reliant, protect the rights of smallholders and satisfy the intellectual property rights demands voiced by the seed industry. Using Malaysia as a case study, this paper argues that presents these problems can be overcome by adopting measures to marry the interests of seed industry and smallholders including the preservation of time honored farm saved seed sharing traditions, to the creation of a large scale seed production, the reduction of dependence on seed importation, and developing the same models of inter-government, industry and academic cooperation seen during the development of commodity crop industries to develop new, and promote local, varieties of vegetables.

Development of squash varieties, *Curcubita moschata* Duchesne, for organic production system

Maghirang R.G. , Rodulfo G.S. , Grulla M.E. and Enicola E.E

VEGETABLES AND LEGUMES SECTION, CROP GENETICS AND PLANT BREEDING DIVISION, INSTITUTE OF PLANT BREEDING-CROP SCIENCE CLUSTER, COLLEGE OF AGRICULTURE, UNIVERSITY OF THE PHILIPPINES LOS BANOS , PHILIPPINES
megrulla@gmail.com

Tenorio F.A.M
INTERNATIONAL RICE RESEARCH INSTITUTE, LOS BANOS, LAGUNA, PHILIPPINES
Fatima.amor@yahoo.com

Cacal M
DEPARTMENT OF AGRICULTURE-PALAWAN AGRICULTURAL EXPERIMENT STATION, STA. MONICA, PUERTO PRINCESA, PALAWAN, PHILIPPINES
mcacal.dapaes@yahoo.com

ABSTRACT

From 1999 to 2005, several types of squash lines were evaluated after a series of hybridization and selection under organic conditions by the Department of Agriculture in the Philippines. It strictly followed the organic principles of minimal weeding and pest control; and the use of fermented plant food supplements, composted manures and materials for soil nutrient management. The study continued in 2010 with breeding, selection and purification of selected stable squash lines in F6 generation. Selected lines underwent evaluation of horticultural characteristics, yield performance and market acceptability. A preliminary yield trial under organic conditions in Puerto Princesa, Palawan evaluated six top selections and a check variety, Rizalina. The yield trial was based on horticultural and production considerations such as flesh thickness, flesh color and texture, fruit shape, weight, length, and diameter at the top, side and bottom parts, number of seeds per fruit, and yield. Top entries with acceptable fruits are the solo types 1056-1-1 and 1058-1-1; medium size, heart-shaped 10128-1-1; and the long types 101271-2 and 10129-1-1. Lines with the highest potential yields were 10128-1-1 with 38.4 t/h, 10129-1-1 with 35.50 t/h, 1056-1-1 with 22.75 t/h, and 10130-2-1 with 20.9 t/h. The check variety, Rizalina, had a potential yield of 11.30 t/ha only. These top entries were also evaluated in on-farm trials in organic farms in Cavite, Quezon and Palawan to determine acceptability. Results of the on-farm trials include lines 10127 and 10128 as early selections in Lucban, Quezon; 10127 and 1056 in Tayabas, Quezon and selection 10128 in Alfonso, Cavite; and in Quezon, Palawan, line 10128 was preferred for its desirable characteristics. These lines were preferred by the cooperators for their high yielding ability and market acceptability.

Collection, evaluation and conservation of amaranthus germplasm

Padma M
VEGETABLE RESEARCH STATION, DR. Y.S.R HORTICULTURAL UNIVERSITY, HYDERABAD, INDIA
masna_padma@yahoo.in

ABSTRACT

Amaranthus is a common leafy vegetable grown during summer and rainy season in India. The leaves and stems are good sources of iron (305mg/100g),calcium(397/100g), vitamin A(8340 micrograms/100g) and vitamin C (99mg/100g).In India, wide variation exists in stature, morphology and plant pigmentation in different local types, which are highly adapted to the local agroclimatic conditions. Exploitation of available germplasm is essential for conservation of bio-diversity in any breeding programme. Andhra Pradesh is endowed with rich source of Amaranthus germplasm. Farmers mostly cultivate the local varieties. Hence, there is a constant need for collection, evaluation and conservation of germplasm. The research work on evaluation of Amaranthus germplasm was carried out at Vegetable Research Station , Rajendranagar, Hyderabad ,Andhra Pradesh during the period 2012-13 with 43 entries under RBD design replicated thrice. The spacing followed was 30x30 cm. Package of practices were followed as per recommendation. There were significant differences among the entries in vegetative as well as yield parameters. The results indicated that the highest plant height (98 cm) was observed in RNA-1 which was followed by RNT-53(97cm) and RNT-6 (96cm).The lowest plant height (41 cm) was recorded was recorded in RNT-7,RNT-20 and RNT 39.The maximum number of branches (27) was observed in RNT-3 followed by RNT-5 (22) and RNT-6 (20). The minimum number of branches (1.0) was recorded in RNT-37. In Leaf weight , the highest leaf weight (254 g) was recorded with RNT 26 followed by RNT 3 and RNT 7 (250 g each) which were on par with each other. The lowest leaf weight (1.5 g) was recorded with RNT 30. The highest stem weight (525 g) was recorded with RNT 5 followed by RNT 3 (500 g) and RNT 26 (475 g). Whereas the lowest stem weight (3 g) was recorded with RNT 20. In Root weight, the highest root weight (150 g) was recorded with RNT 5 followed by RNT 32 (80 g). Whereas the lowest root weight (25 g) was recorded by RNT 2, RNT 8 and RNT 12.Seed yield was significantly different where maximum seed yield (205.0g/pl) was recorded with RNT -1 followed by RNT -53 (150.0g) and RNA-1(110.0g/pl). The lowest seed yield was recorded with RNT 3, RNT 7 and RNT 38 (6 g each.).Based on results RNT 24, RNT 26, RNT 32, RNT 52 and RNA-1 were promoted to compare with commercial entries for further trial.

Genetic diversity studies in paprika germplasm (*Capsicum annuum* L.)

Prabhakar B.N
ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY, INDIA
drboganeeraja@gmail.com

ABSTRACT

Paprika (*Capsicum annuum* L.) is one of the most valuable commercial spice-cum vegetable crops grown in India. 55 exotic and indigenous genotypes along with three checks were evaluated and the D2 analysis was carried out for 19 characters. Maximum divergence was observed between cluster VII and VIII, while minimum was between cluster III and I. The maximum intra cluster distance was shown by cluster V. The clusters showing high genetic divergence could be effectively utilized in heterosis breeding programme. Cluster VI (IC572490) showing maximum capsanthin content can be utilized in breeding programme. IC570388 (plant height), IC-572456 (plant spread), EC-599993(PR) (number of branches per plant and capsaicin), EC-599981(fruit length), IC-572472 (fruit pedicel length), EC-599978 (vitamin C content), IC-57246 (seed content), IC-572490 (capsanthin), IC-572469 (stem length), EC-596940 (early maturity) were identified as promising lines. Fruit yield per plant has exhibited highly significant positive correlation with fresh fruit weight followed by fruit width, dry fruit weight, fruit pedicel length, plant height, number of fruits per plant, stem diameter, fruit length, plant canopy width and 1000 seed weight. Pathanalysis revealed maximum positive direct effect on fruit yield, moderate positive direct effect on fruit length, plant height and low positive effect on Vitamin C content.

Session 2: From Seed to Harvest

Parallel session 2b: Sustainable production

25 February 2014 (Tuesday)

Food and nutrition security related to vegetable production, and future perspectives of Lao PDR, the particular case in Vientiane municipality

Douangsavanh L
NATIONAL AGRICULTURE AND FORESTRY RESEARCH INSTITUTE, VIENTIANE, LAO PDR
dlinkham@yahoo.com

ABSTRACT

The economic theory is to assist farmers to shift from the subsistence to the market–oriented production in order to increase food-nutrition security and income of the smallholder farmers. Usually this means they obtain cash to cover rice shortages and income. There are risks associated with this shift, because the markets are not well understood. The main focus has been on the production side, but the market needed to understand about the demand, quality of the product, etc, especially on demanding on vegetable consumption in Vientiane itself and Thai border market on organic vegetable. Therefore, the Vientiane authority as same as with the government policy to promote the vegetable production. The technology driven market-transition has been risky. The cash crops and vegetable production should not be promoted unless the market is well-understood and how to promote the processing on vegetable production. The local-level organization should focus not only on production, but also on procession and marketing. Equity in access to opportunities is the key to understanding the economic impact of markets. And the skills to market-oriented production are lacking at the local level. There is a need for not only technical expertise, but also the experience with contracts, market access, production process, policy support and so on.

Integrating biopesticides with chemical pesticides to manage legume pod borer (*Maruca vitrata*) on yard-long bean in Lao PDR and Vietnam

Srinivasan R
AVRDC – THE WORLD VEGETABLE CENTER, PO BOX 42, SHANHUA, TAINAN 74199, TAIWAN
srini.ramasamy@worldveg.org

Hien N.T.T. , Trang V.T.T. , Khánh L. Đ. And Hai V.M.
VIETNAM ACADEMY OF AGRICULTURAL SCIENCES, THANH TRI, HANOI, VIETNAM

Phommachan C, Vilaysone P and Kodsimouang S
CLEAN AGRICULTURE DEVELOPMENT CENTER, DEPARTMENT OF AGRICULTURE, MINISTRY OF AGRICULTURE & FORESTRY, VIENTIANE, LAO PDR

ABSTRACT

A lack of studies on the effectiveness of biopesticides against legume pod borer (*Maruca vitrata*) on yard-long bean in Lao PDR and Vietnam has limited their use in integrated pest management (IPM) strategies. An earlier study confirmed the susceptibility of M. vitrata to selected biopesticides under laboratory conditions in Vietnam. A series of field trials were carried out to confirm the potential of biopesticide application in combination with chemical pesticides against M. vitrata on yard-long bean in Lao PDR and Vietnam. Four field trials were conducted at Gia Lam, Hanoi, Vietnam during 2011 – 2012, and two field trials at the Clean Agriculture Development Center, Vientiane, Lao PDR during February – May 2012. The Bacillus thuringiensis-based treatments reduced pod damage by 50%, and in Vietnam yard-long bean yields were 17 to 50 times higher than the untreated check. Similarly, yard-long bean pod damage in Lao PDR by M. vitrata was reduced by 9-44%, with significant yield increases (63-68%) in B. thuringiensis-based treatments. The effect of entomopathogenic fungi and neem-based treatments did not reduce losses. Based on these results, B. thuringiensis is a promising component for IPM strategies against M. vitrata on yard-long bean in Lao PDR and Vietnam.

Year round vegetables production and quick growing fruit trees in homestead

Khan ASM M.R, Sarker M.J.U and Chaki A.K
ON-FARM RESEARCH DIVISION, BARI, GAZIPUR, BANGLADESH
mahbuburi.bio@bari.gov.bd

Islam M.S
ON-FARM RESEARCH DIVISION, BARI, PABNA, BANGLADESH

ABSTRACT

A study was conducted among rural households at Pushpopara, Pabna, Bangladesh during July 2012 to April 2013 to ensure proper utilization of all the available spaces in the homestead area and to supply vegetables and fruits for the family members round the year and protect malnutrition hazards. The program was carried out following "Goyeshpur Model"- a homestead model developed from farming system research site, Goyeshpur, Pabna under Agricultural Research Station of Bangladesh Agricultural Research Institute in 1997 for enhancing year round vegetables and quick growing fruits production in homestead in a planned and scientific way. It includes nine production units-open land, roof top, trellis, tree support, partial shady area, marshy land, fence, homestead boundary and backyard or waste land. The size of the average homestead varied from 600-700 m2. Total vegetables and fruits production per homestead per year was 960 kg and 864 kg, respectively whereas it was 205 kg and 250 kg, respectively before intervention of the technology among the farmers. Proteins were supplied from the homestead source was 17.76% for male and 19.54% for female. Vit-A and vit-C supplementation was estimated as 277% and 437% for both male and female members, respectively. Iron and vit-B supplementation was calculated as 57.78% and 53.42% for male as well as 50.14% and 64.11% for female members, respectively. These findings provided a lucid idea that most of the household farmers have met their daily requirement of vegetables and fruits from their home garden. The vegetables and fruits provide balanced diet through supply of rich energy, proactive nutrient like vitamins, minerals such as iron etc. From the vegetables production total income was recorded as Tk.9111 per household. The gross margin was recorded as Tk.7671 against total variable cost of Tk. 1484. In case of fruits that total income, variable cost and gross margin were Tk. 22732, 1728 and 21004 respectively. Basically, the activities of home gardening concentrated on women, who might use household resources better and have advanced empowerment. This empowerment of women delivered social-economic benefits through contribution to reducing gender inequality and poverty alleviation. Moreover, homestead plays a key role in improving food security and livelihoods by providing diverse vegetables and fruits in the family. As a result, the nutrition demand of the farm families is fulfilled as well as they earn some money by selling the excess product in the local market.

Pilot experiences of area-wide promotion and adoption of fruit fly Integrated Pest Management Farmer Field Schools in lower Mekong River Basin countries

Kumar P
ASIAN CENTER OF INNOVATION FOR SUSTAINABLE AGRICULTURE INTENSIFICATION (ACISAI), ASIAN INSTITUTE OF TECHNOLOGY, PATHUMTHANI , THAILAND
pkipm@ait.asia; pkipm@yahoo.com

Ketelaar JW
FAO'S REGIONAL IPM PROGRAMME IN ASIA; FAO-RAP, BANGKOK, THAILAND
Johannes.Ketelaar@fao.org

ABSTRACT

The Asian region (East, Southeast, and South) is among the top three regions worldwide in terms of annual exports and imports of fresh fruits and vegetables. The productivity and quality of many fruits and vegetable crops produced are seriously reduced by the tephritid fruit flies (*Bactrocera dorsalis* & *Bactrocera cucurbitae*). Tephritid fruit flies caused direct damage to fruits and vegetables leading to 90-100% yield losses depending on locality, variety and season and indirect loss is by reducing the trade potential due to strict quarantine regulations. Until recently, area-wide fruit fly IPM promotion efforts in Asia have focused largely on introduction of the sterile male technique, without attention to status of farmers education and promotion of an integrated management approach. Adoption of fruit fly IPM among smallholder farmers has been negligible and impact on control of fruit fly populations is limited.

The Asian Fruit Fly IPM Project, which is a newly-established collaborative effort among various public sector partners (AIT, FAO-IPM and associated National IPM Programmes in the Greater Mekong Subregion) and the private sector (Biological Control Research Laboratory, India), aims to promote the adoption of area-wide Integrated Pest Management and educate farmers on the ecology and management of Bactrocera fruit flies through participation in Farmer Field Schools.

Since the Project inception in September 2010, various capacity building training and action research activities were conducted at regional and country-level. These activities have led to country-specific project interventions, strategic design of effective 1-2-3 IPM strategies (1. Protein Bait, 2. Sanitation, the latter two for population management and 3. Lures for population monitoring). Project outputs also include innovative development of fruit fly IPM training curricula and materials (*see* http://ipm.ait.asia).

This paper will outline pilot experiences of area-wide fruit fly IPM and present the innovative farmer education initiatives developed in all 4 Greater Mekong Subregion project member countries (Cambodia, Lao PDR, Thailand and Vietnam).

Effect of organic matter application, conservative tillage and reduced chemical fertilizer use on vegetable yield and soil organic carbon content on a volcanic ash soil in west Java, Indonesia

Sugino T
JAPAN INTERNATIONAL RESEARCH CENTER FOR AGRICULTURAL SCIENCES. TSUKUBA JAPAN
tosugino@jircas.affrc.go.jp

Sumarni N , Rosliani R and Suwandi
INDONESIAN VEGETABLES RESEARCH INSTITUTE, LEMBANG, JAWA BARAT, INDONESIA

Setyorini D and Hartatik W
INDONESIAN SOIL RESEARCH INSTITUTE, BOGOR, WEST JAVA, INDONESIA

ABSTRACT

To establish vegetable cropping systems which can reduce chemical fertilizer use and increase soil organic carbon, a field experiment was carried out from 2011 to 2013 on a volcanic ash soil in Lembang, West Java, Indonesia. Twelve treatments combining organic matter, chemical fertilizer and tillage were applied. The organic matter applications used were 0ton/ha, 10ton/ha and 20ton/ha. Chemical fertilizer applications used were NPK1 (standard dosage): 113.0kg N/ha, 96.0kg P2O5/ha, 120.0kg K2O/ha; NPK1/2 (half dosage): 56.5 kg N/ha, 48.0 kg P2O5 kg/ha, 60.0 kg K2O/ha. Fertilizer applications were selected to provide consistent amount of nutrients assuming that only a part of nutrients in manure would be released in a cropping season. Tillage practices used were conventional tillage (CT) and minimum tillage (MT). MT is a tillage practice which minimized soil disturbance except planting hole. Plants were harvested and the yield was determined. Cabbage (*Brassica oleracea L.* var. *capitata*) and tomato (*Solanum lycopersicum*) were mix-cropped in the first cropping season (rainy season, starting in September). Bean (*Phaseolus vulgaris*) was planted in the second cropping season (transitional season, starting in January) and corn (*Zea mays*) was planted in the third cropping season (dry season, starting in April). The soil organic carbon content was determined before the experiment and after maze was harvested. In the first year the cabbage yield in some plots were significantly lower due to the outbreak of clubroot disease. In the second year the yield was not significantly different among all the treatments. Marketable tomato and bean yield was not significantly different among all the treatments both in the first and second year planting. 20t/ha organic matter application significantly increased corn yield comparing 0t/ha organic matter application in the first year. In the second year corn yield in the 20t/ha organic matter application was significantly higher than that of 0ton/ha and 10t/ha organic matter application. Overall there was no significant yield reduction with reduced chemical fertilizer application and tillage practices. This suggest that chemical fertilizer application can be substituted with organic matter without reducing yield Application of organic matter at the rates of 10 and 20 mt/ha resulted in larger SOC changes compared to no organic matter application. The MT treatment showed higher increase in SOC than the CT treatment. Results of the experiment can be recommended as a practical farm management system to increase soil organic carbon while reducing chemical fertilizer application and hence maintaining the vegetable yield and also increasing farmers' income.

Production and utilization of organic inputs using beneficial microorganisms

Ponciano G. Y.
TARLAC COLLEGE OF AGRICULTURE, ROMULO, CAMILING, PHILIPPINES
gyponciano@yahoo.com

ABSTRACT

The microbial inoculums is a blending of a multitude of beneficial microbes and were mixed with molasses, maintained at low pH under ambient conditions. Results showed the effectiveness of beneficial microbes in diversified activities such as composting, crop production and bioremediation. Results showed that the organic compost fermented with beneficial microbes has a very high percentage of 57.1% organic matter; 3.0% nitrogen; 8.70% phosphorous and 5.2% potassium. The study revealed that there was an increased in the yield of crops and vegetables when applied with BM organic inputs.

Adoption, yield and profitability of tomato grafting technique in Vietnam

Genova II C. A.
CONSULTANT, ICF-GHK CONSULTING, REBEL GROUP
genova.christian@gmail.com

Schreinemachers P
AVRDC – THE WORLD VEGETABLE CENTER, PO BOX 42, SHANHUA, TAINAN 74199, TAIWAN
pepijn.schreinemachers@worldveg.org

Afari-Sefa V
AVRDC – THE WORLD VEGETABLE CENTER REGIONAL CENTER FOR AFRICA, ARUSHA,TANZANIA
victor.afari-sefa@worldveg.org

ABSTRACT

This paper assesses the impact of AVRDC's tomato grafting on yield and farm profitability in Lam Dong province and Red River Delta, Vietnam. Tomato grafting is advantageous to farmers suffering from soilborne disease and abiotic stresses. However, the extent of knowledge concerning adoption studies of tomato grafting technology in Vietnam is nil. This paper provides detailed results from the farm household survey conducted in August 2012 using semi-structured questionnaire. Results show a 100% (n=225) adoption in Lam Dong province, and a 48% (n=36) adoption in the Red River Delta. The use of rootstock varieties differ in both locations to address location-specific problems: tomato variety Vimina (or HW7996) to address bacterial wilt (BW) problem, and eggplant EG203 variety in the Red River Delta to address both BW and waterlogging problem. The use of grafting in tomato production increases yield by 30% based on a Cobb-Douglas production function. Yield was significantly larger (73.3 t/ha in Lam Dong Province and 81.4 t/ha in Red River Delta) and more stable all year-round than non-grafted (56.5 t/ha in Red River Delta) based on farmers' 2011/2012 production cycle. The benefit-cost ratio of grafted tomato production was higher due to yield and market price advantage. Nonetheless, further studies would be useful considering the relatively small sample size in the Red River Delta and the high variation observed for some of the variables. The study clearly shows that in places where bacterial wilt and other soilborne diseases affecting tomato are a problem, tomato grafting offers very significant monetary benefits to farmers.

Effect of trichoderma on horticultural crop cultivation

Angelia I.O.
POLITEKNIK GORONTALO JALAN SAPTA MARGA DESA PANGGULO BARAT KECAMATAN, INDONESIA
elle_ipb@yahoo.com

ABSTRACT

According to the agricultural statistic Indonesia 2012, harvested area in which cabbages and scallions have been grown are 64.277 hectares and 58.427 hectares. Total yield of cabbages and scallions are approximately 22,56 ton/ha and 10,21 ton/ha (www.bps.go.id). Recently, demand for horticultural crop (especially vegetables) was increased year by year. However, it wasn't followed by the availability of horticultural products. This is caused by several reasons included: agricultural land began to decrease due to industrialization and the number of housing was increasing, low crop performance due to damage by pests and diseases, inefficient crop management, limited access to knowledge and technology for good agricultural practices. Plant disease, especially root diseases cause significant losses in horticultural crop production. Required an effort to boost agricultural production with make efficient crop management and eco-friendly management by utilizing microorganism as bio-control agents.

Bio-fertilizer plays an important role in horticulture cultivated with reduced chemical fertilizer use. Trichoderma spp. are free-living fungi that was often found in soil and root ecosystems which had been known to possessed bio control qualities against a number of plant pathogens since the 1920s. Recent discoveries showed that they are opportunistic, avirulent plant symbionts, as well as being parasite of other fungi. They produce or release a variety of compounds that induce localized or systemic resistance responses, and this explains their lack of pathogenicity to plants. The purpose of current report was to determine the effects of Trichoderma against to chemical fertilizer consumption on horticultural crops.

Substitution of chemical fertilizer with vermicompost and its influence on production potential of cabbage (*Brassica oleracea* L. var. *capitata*)

Ghosh C
AGRICULTURAL AND FOOD ENGINEERING DEPARTMENT, INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR, INDIA
chinanshuk.ghosh@gmail.com

ABSTRACT

An experiment was conducted in the farmer's field during winter 2008 and 2009 in Red & Lateritic belt of West Bengal to study the effect of gradual substitution of chemical fertilizer with Vermicompost (V.C.) in Cabbage (*Brassica oleracea* L. var. *capitata*). The experiment was laid in completely randomized block design with three replications and seven treatments, which were control (T1; *i.e.* no FYM/V.C. and no chemical fertilizers); 100% NPK (T2; *i.e.* NPK @ 120:60:60 and no FYM/V.C.); 25% V.C. + 75% NPK (T3); 50% V.C. + 50% NPK (T4); 75% V.C. + 25% NPK (T5); 100% V.C. (T6) and 100% FYM (T7). Application of organic and inorganic fertilizers in equal quantity (i.e. T4; 50% V.C. + 50% NPK) promoted early head maturity. The same treatment also resulted maximum gross head weight (1.700 and 1.390 kg) and net head weight (1.540 and 1.00 kg). Polar diameter and equatorial diameter of head were found at par for all the treatments, except T5 (75% V.C. + 25% NPK) that showed minimum equatorial diameter (43.9 cm) during first year and T4 (50% V.C. + 50% NPK) that showed maximum equatorial diameter (35.23 cm) during second year. The crops treated with 100% chemical fertilizers (*i.e.* T2) were noticed *at par* with T5 (*i.e.* 75% V.C. + 25% NPK) in terms of total production for both the year, which indicates that reduction of chemical fertilizer (NPK) up to 75% is possible without any yield compromise. Again, application of 50% V.C. + 50% inorganic fertilizers (NPK) gives additional yield benefits of 15.1% and 21.5% over 100% NPK treated plants in first and second year, respectively. The finding implies that a substantial amount of chemical fertilizer may be replaced by the application of vermicompost in cabbage cultivation.

Biological control agent (*Metarhizium anisopliae*) against flea beetles on pechay

Pagluanan E. R.
erpagluaran@yahoo.com

ABSTRACT

The study was conducted at the Experimental area of Abra State Institute of Sciences and Technology from February to April 2012, to determine the efficiency of *Metarhizium anisopliae* as biological agent of flea beetles on pechay. Specifically the study aimed to evaluate the efficacy of different rates of *Metarhizium anisopliae* extract as biocontrol agent of flea beetles on pechay and to determine the influence of *Metarhizium anisopliae* on the leaf quality of pechay.

Based on the findings of the study, the different rates of *Metarhizium anisopl*iae extract had significant effect on population of flea beetles after application and percentage mortality of flea beetles.

No significant differences were observed among the treatments in terms of growth increment, final height, and weight, population of flea beetles before application and percentage of damaged leaves. However, it appeared that among the parameters observed, 250ml of M.A. extract gave a significant result.

Yield and quality parameters of Bydagi chilli as influenced by nitrogen substitution and bio rational spray schedules

Shivaprasad M.
DEPARTMENT OF AGRONOMY, UNIV OF AGRIL SCI., KRISHINAGAR, KARNATAKA INDIA

ABSTRACT

A field experiment was conducted at Agricultural Research Station, Devihosur, Haveri, Karnataka during 2005 and 2006 to study the effect of N substitution, biorationals on yield and fruit quality of chilli. Sources of nitrogen Viz., entire NPK through fertilizer (RDF @ 100:50:50 kg NPK ha-1) and 50:50:50 kg ha-1 NPK through fertilizers and remaining 50% N substitution equally through 2.5 t ha-1 Vermicompost and 500 kg ha-1 neem cake were main treatment and biorational sprays and controls (pesticides or no pesticides) were sub plot treatments. Of the two nitrogen treatments the significantly higher yield was recorded with 50 per cent N substitution through organics (795 kg ha-1) compared to RDF. Abamectin (3 times) + Perfect (2 times) also produced good quality fruits by nearly 44 per cent over chilli grown with normal recommended sprays (RPP) of two sprays of Dimethoate (1.7 ml l-1) + 2 sprays of Dicofal (2.5 ml l-1) + Carbaryl (4g l-1). The nitrogen substitution and alternate sprays of Abamectin and Perfect helped in obtaining significantly higher quality parameters viz., yield of good quality fruits, ascorbic acid content, capsaicin content, Scovielle heat units, per cent discoloured fruits, oleoresin content and oleoresin yield.

Session 3: From Harvest to Table

25 February 2014 (Tuesday)

Linking vegetable growers to organized retail markets: the experience in India

Chengappa P.G
INSTITUTE FOR SOCIAL AND ECONOMIC CHANGE BANGALORE, INDIA
chengappapg@gmail.com

ABSTRACT

Indian agriculture is diversifying towards high value commodities comprising of vegetables, fruits, livestock and fisheries due to changing consumption patterns, fast urbanization and increase in income levels. The vegetable production has recorded a growth rate of 4.5 percent per annum during 1991- 2010 period as compared to the average growth of 2.5 percent per annum of the agricultural sector as a whole. Vegetable production represents an important area for income growth, especially for small and marginal famers. Vegetables being perishable, bulky with low shelf life, the supply chain management issues get complicated. Most often, the supply chain for vegetables is highly unorganized, fragmented and exploitative resulting in low share of producers in consumers' rupee. In this study, the contract farming model and backward integration approach adopted by the food retail chains in improving the supply chain for vegetables have been analyzed.

The experiences in India of contracting firms both of foreign and domestic origin indicate strong evidence of backward and forward linkages benefitting farmers. These firms provided quality inputs such as seeds, fertilizers, and plant protection chemicals to the farmers at their gate coupled with the technical advice on production aspects. This enabled the farmers to reduce their working capital needs. The linkage substantially reduced their transaction cost per unit of output as the marketing was taken care by the firm. In general, contract farming helped farmers to improve their income levels by adopting intensified agriculture and reduction in transaction costs. However, due to the poor resource base, most small and marginal farmers appear to be not part of such an institutional arrangement.

The Food Retail Chains (FRC) are evolving and growing at a fast pace in India. The FRCs were found to depend mostly on the existing channels of marketing to source vegetables and not practicing backward integration because of the restrictions they face as per the existing market laws besides operational difficulties. In the recent years, amendments in market regulation Act in some states of India have enabled few of the FRCs to establish backward linkages with farmers for procuring fresh vegetables following a Farmer - Vendor model wherein FRC directly purchased vegetables from selected famers without entering in to a contract. This arrangement reduced the market risks and transaction costs to the farmers. Enabling direct supply by farmers enabled FRCs to increase their control over quality, supply reliability and price stability. Farmer's who had opportunities to tie up with FRCs have increased their income through improved agricultural practices, growing of high value exotic vegetables throughout the year and reduction in transaction cost. The concept of Ready to Retail adopted by the FRC is to the benefit of the farmer – vendors as they realized higher returns by performing additional marketing functions such as cleaning, grading and packing at the farm level. However, the farmer - vendor model has participation of few small and marginal farmers because of their limitation to invest in creating irrigation facilities which is crucial for growing quality vegetables. Further, the fact that the FRC purchased only good quality vegetables have resulted in farmers not finding the market for rejects.

Participatory guarantee system - the new way to achieve safe vegetables in farming context of Vietnam (PGS)

Ha N. T.
CENTRE OF AGRARIAN SYSTEMS RESEARCH AND DEVELOPMENT, VIETNAM AGRICULTURE ACADEMIC OF SCIENCES, HANOI, VIETNAM
hanguyenhua@gmail.com

ABSTRACT

In consideration of the existing food safety situation in Vietnam, particularly for vegetable, there is a need for a quality certification system which is suitable for the farming condition of small and medium family farmers. The study focuses on suitability of the Participatory Guarantee System (PGS) structure and organization for Vietnam where smallholder farmers account for 80 percent of agricultural producers. Ninety farmers from Hoa Binh Province, Phu Tho Province and Lang Son Province, 20 government officials, 25 store owners selling PGS vegetables and 120 consumers were interviewed from March to June 2013. During the production process under PGS, the farming households were provided with additional production knowledge, inspection skill and continuous capacity strengthening to operationalize PGS as quality control system for vegetable production.

Results show that the manner of PGS organization is suitable for the conditions of production in Vietnam. PGS has shown its economic efficiency over the years, with higher income derived than the conventional vegetable production. PGS-certified vegetables bring about 2 to 4 million VND (US$100-200)/360 square cropping higher benefit compared to growing vegetables in conventional way. Meanwhile, the certification cost is low and affordable to the smallholder farmers which cost about VND 250-350 thousand per household per year. PGS has also established connections among organizations of producers, distributors and consumers. As a result of achievements in application of PGS in vegetable production, PGS has practically built up trust of local government. At present PGS has been expanded in the existing production regions as well as initiated in Hai Phong and Vinh Phuc province. While there are achievements, PGS has one fundamental obstacle – it is not yet officially approved by the State as a system for managing quality and safety of production that is fundamental to achieving food safety from farm to table. Supports from the central government as well as local authorities in terms of infrastructure, land consolidation for production, technology transfer, promotion and training farmers are essential to ensure the efficiency and success of PGS.

Mapping vegetables - Understanding the food system of greater Bangkok, Thailand - A web-based collaborative research environment

Drescher A.W , Glaser R and Hoschek M
UNIVERSITY OF FREIBURG, DEPT OF ENVIRONMENTAL SOCIAL SCIENCES AND GEOGRAPHY, PHYSICAL GEORGRAPHY, GERMANY
axel.drescher@geographe.uni-freiburg.de

Holmer RJ
AVRDC – THE WORLD VEGETABLE CENTER, EAST AND SOUTHEAST ASIA, BANGKOK THAILAND

Chulaka P
KASETSART UNIVERSITY, DEPARTMENT OF HORTICULTURE, BANGKOK THAILAND

ABSTRACT

Urban and periurban vegetable production and marketing systems have the potential to contribute to poverty reduction, food and nutritional security, local economic and community development, social inclusion of marginalized groups and women in particular, as well as to enhance urban environmental management by increasing biodiversity and the productive reuse of organic wastes. This project looked at 4 components of the overall food system: Smallholder Vegetable Producers, Community Gardeners, Markets, Consumers and Street Vendors. In order to better understand the linkages and importance of each of these components a so-called pilot Collaborative Research Environment (CRE) was developed. The core of the CRE consists of a central, spatially enabled database and a range of associated tools for distributed data entry, for remote and real-time monitoring of the incoming data, for data analysis, and last but not least for data presentation. The tools include the required Geographic Information System (GIS) functionality for spatial analysis and map-based visualization. In the pilot study the data included in the CRE comprises empirical data from different sources such as questionnaires and surveys, spatial information on production areas in relation to vegetable diversity as well as information on producers, traders and consumers. The producer survey shows the importance of market demands and prices influencing the decisions on which kind of crops and vegetables are grown. Other important factors here are farmers' skills and habits as well soil and water conditions. All those are strongly interrelated. Plant diseases and pests as well as climate and weather conditions are identified as major challenges for the vegetable producers. However 47% of the Producers produce more than ¾ of their self-consumed vegetables. For the community gardeners' urban gardening in Bangkok is not about food security in the sense of essential food provision: More than 70% of the interviewees never face difficulties in providing enough food for their family and around 20% rarely do, mainly because of poor harvests. However, a lot of the interviewed people refer to the problem of chemical pollution of market vegetables. Wholesale markets play a big role for the food security in the Greater Bangkok. About 52% of products from Si Mum Muang Market stay in the Bangkok Metropolitan Area and 85% in the Greater Bangkok Area (including surrounding provinces). Many products come from the North and Northwest of Thailand but a considerable share is also grown in the periurban area around Bangkok. A number of perishable products like e.g. Lettuce and Kale are mostly grown in the proximity of the Megacity. This once again proves the importance of periurban agriculture for food security in Bangkok. More than 70% of the local markets and over 50% of street vendors and restaurants buy at wholesale markets Si Mum Muang and Talad Thai. Regarding consumption the survey identifies clear differences between men and women. Vegetables are eaten by 65% of male and 80% of female participants. 41% of the male and 51% of the female interviewees eat fruits. For milk products the distribution can be grouped into 32% male and 41% female consumers. 65% of men and 70% of women eat meat minimum every day. Fish/seafood are eaten 24% by men and 28% by women. It is noticeable that women are consuming all food groups more frequently. Other differences get obvious looking at different age groups. It gets clear that food habits are changing. Regarding food purchase and consumption, local markets are of extraordinary importance in Bangkok. The most common challenge for consumers in vegetable usage is the price.

Farmer's market in developing and developed countries

Nath P
FORMER ASSISTANT DIRECTOR GENERAL, FAO
CHAIRMAN, PREM NATH AGRICULTURAL SCIENCE FOUNDATION (PNASF), BANGALORE, INDIA
drpremnath@vsnl.net

Velayundhan S
velusunvel@aol.com

ABSTRACT

In developing countries, the farmers' markets have successfully established a link between producers and consumers of nearby communities and synchronized supply of food available with the available buyers. This idea and approach took its birth probably centuries ago in villages and rural communities to fulfill their requirement of food, before towns and cities came into existence. In developed countries, during the course of time, the famers' market increased in number, size, nature and scope. It has become popular among common people who have preference for fresh and traditional fruits, vegetables, flowers, fast food and drinks and other daily needs of particular ethnic interest. The presentation will discuss and illustrate on characters and developments of farmers' market, observational visits, genetic resources availability and prospects of farmers' market in both developed and developing countries.

From harvest to table: Enabling informed nutrition choices and greater access to nutritious vegetables in southern Bangladesh

Rose R
INTERNATIONAL DEVELOPMENT ENTERPRISES (IDE), DHAKA, BANGLADESH
richard.rose@ide-bangladesh.org

Siraj S
SAVE THE CHILDREN IN BANGLADESH, DHAKA, BANGLADESH
saiqa.siraj@savethechildren.org

ABSTRACT

In Asia low income families often suffer from poor access to healthy foods and low ability to make good nutritional choices. The Agriculture and Nutrition Extension Project (ANEP) has been supporting vulnerable families to make healthy food choices in southern Bangladesh since January 2012. The ANEP aims to sustainably raise agricultural productivity, promote effective market linkages and nutritional awareness to improve the nutritional behavior of poor rural and urban households. ANEP brings together iDE, World Fish, CIMMYT, IRRI -Save the Children, and CODEC and is funded by the European Union (EU).

ANEP urban interactive nutrition education sessions aims to increase knowledge on maternal, adolescent and child nutrition and improve skills to support practice of age specific appropriate feeding behaviors. This is complemented by the promotion of adoption of seasonal producing vegetable varieties which are both high in vitamins and micro-nutrients and commercially viable. To bring nutritious vegetables to market, ANEP developed durable commercial linkages between rural producers and markets serving low-income urban consumers using a Participatory Market Chain Approach (PMCA).

Program data indicates increases in vegetable productivity (bitter gourd 28%, bottle gourd 34%, and sweet gourd 40% per decimal); and, evidence of improved nutrition behaviors amongst urban adolescents -70% can indicate one iron enriched food (BL 53%) and 50% know iron-rich foods required during menstruation (BL 7%). The data suggests that using targeted nutrition education in combination with agricultural inputs and rural-urban market linkages delivers synergies which can improve nutrition behaviors amongst the most vulnerable.

Key topic areas: health and nutrition aspects of vegetables, food consumption and nutrition in the 21st century, and measures to improve the role of vegetables in nutrition.

Effectiveness of Ca-salts in reducing HCN content of Jack bean legume seed (*Canavalia ensiformis*) and its products

Arpah M, Richard S, Kusnandar F, Cahyaning P and Prsetyo AT
DEPARTMENT OF FOOD SCIENCE & TECHNOLOGY, BOGOR AGRICULTURAL UNIVERSITY, BOGOR, INDONESIA
arpahsaleng@yahoo.com

ABSTRACT

Jack Bean (*Canavalia ensiformis*) has a great potential as soy bean substitute as well as protein sources. Farmers are reluctant to cultivate because of its low economic value due to high hydrogen cyanide content. Cyanide can be removed from the seeds gradually by applying various combinations of processing . This study aims to reduce the HCN content of tempeh , tofu and modified flour of Jack bean seeds down to below the threshold that is safe for consumption. The results showed that by extending soaking period in calcium salts and then heating reduced HCN content of the beans to a level around 70% of the seeds' initial content. In addition, fermentation process was also effective in reducing HCN, so that the tempeh produced contained HCN at concentration as low as 1.2 ppm, tofu < 2.0 ppm and 5.0 ppm on flour. All of these values are well below the standard safety limit set by FAO. The HCN content of the initial seed was 14.83 ppm, therefore as much as 92 % reduction was obtained for tempeh, 91 % for tofu and 66 % on flour. Safety limit of HCN content in cassava flour specified by FAO is < 10 ppm.

Keywords:

HCN, Jack bean, Ca-salts.

Nutrient composition and sensory evaluation of drumstick (*Moringa oleifera,* Lam) leaf products

Bhuvaneswari G , Ganiger V. M. and Madalageri M. B.
COLLEGE OF HORTICULTURE UNIVERSITY OF HORTICULTURAL SCIENCES, BAGALKOT, KARNATAKA, INDIA
bvndwd@yahoo.co.in

ABSTRACT

Drumstick (*Moringa oleifera*, Lam) an indigenous under exploited plant is now valued for health care besides providing the pods for vegetable with improved understanding of nutraceutical values for pods and leaves of drumstick. Nutrient composition of pods and leaves of drumstick KDM-01 (Bhagya-recently released variety from University of Horticultural Sciences, Bagalkot during 2012) and S-6/4 (Dhanraj) and sensory evaluation of products incorporated by dehydrated drumstick leaf powder at different levels was carried out at College of Horticulture, University of Horticultural Sciences, Bagalkot, Karnataka, India.

Results revealed that there was no significant was observed between the varieties with respect to proximate composition of pods and leaves. In micronutrient composition pods showed significant difference between the varieties in ascorbic acid, phosphorus, potassium and magnesium contents. The pods of variety KDM-01 was significantly higher in ascorbic acid (138.54 mg/100 g), phosphorus (109.70 mg/100 g) and magnesium (24.50 mg/100 g) contents. Whereas, the pods of the variety S-6/4 was significantly higher in potassium (265.28 mg/100 g) content. In leaf micronutrient composition, KDM-01 variety showed significantly higher ascorbic acid (17.48 mg/100 g), calcium (2399.11 mg/100 g) and copper (0.081 mg) contents than variety S-6/4 (15.82 mg/100 g, 2081.77 mg/100 g and 0.073 mg/100 g, respectively). Whereas, the leaf of S-6/4 was significantly higher in iron (28.56 mg/100 g) than KDM-01 (27.36 mg/100 g).

With regard sensory evaluation studies, the acceptability of Thalipattu incorporated with 5 per cent fresh leaves was accepted highly followed by 5 per cent dehydrated leaf powder. Rice Kichdi prepared by incorporation of 7.5 per cent dehydrated drumstick was accepted most followed by control (without incorporation of drumstick leaves). Products incorporated with drumstick leaves at different levels showed corresponding elevation in micronutrient composition. Drumstick leaves as an outstanding indigenous source of highly digestible protein, calcium, iron, ascorbic acid and vitamin A can be exploited either in fresh or in dehydrated form in the traditional food items would help in alleviating the micronutrient deficiencies at a cheaper and most affordable way.

Farm profitability and value chain management: Case study from India

Sivabalan K.C., Swaminathan B. and Thiagarajan B.
DEPT OF AGRIL EXTENSION AND RURAL SOCIOLOGY, TRICHY, TAMIL NADU, INDIA
shiv_balan@yahoo.com

ABSTRACT

In India, horticulture sector contributes 28 percent of the Agricultural Gross Domestic Product (GDP) and 56 percent of the total agricultural export earnings. Though vegetable crops have strong potential for income generation, major problems encountered by the farmers are perishability, market price fluctuation and cost of cultivation (especially transport cost). The supply chain and market efficiency plays a crucial role in realizing the value for the vegetable growers. The tomato being highly perishable crop needs utmost attention in value chain management especially in the post-harvest domain. There should be a proper linkage between the producers and the market in order to prevent the price exploitation by middlemen. In this context, a research study was carried out on farm profitability and value chain management of Tomato growers in Trichy district of Tamil Nadu, South India. About 100 tomato growers were selected using multistage random technique. The value chain management of the respondents was explored using semi structured interviews with key informants. The constraints felt by the farmers in accessing the market were analyzed using Garrett's Ranking Technique. It was estimated that around 20-25 percent of the tomato harvest was lost due to lack of post-harvest and proper storage facilities. The majority of tomato growers (56 per cent) were unaware of market intelligence and price forecasting given through ICT tools viz., farmers call Centre and mobile SMS .For increasing profitability and sustainability, intervention of Information and Communication Tools is the need of the hour. Facilitating development of agricultural clusters and farmer producer companies can bring out horizontal integration of vegetable growers as well as vertical integration of all the members of the supply chain. For reaping the economic benefits out of vegetable production, coherent efforts should be initiated, involving all the stakeholders of vegetable value chain. Thus seeking opportunities across the value chain to improve the farm profitability is imperative and needs intervention ICT tools which facilitate linkage of farmers with markets.

Keywords

Tomato value chain, ICT (Information and Communication Tools), Agricultural Clusters, Farmer Producer Companies, Market linkage.

From harvest to table: Enabling higher value production in vegetable supply chains through market-based interventions in the coastal chars of southern Bangladesh

Amin N, Hossain T and Rose R
INTERNATIONAL DEVELOPMENT ENTERPRISES (IDE), DHAKA, BANGLADESH
nurul.amin@ide-bangladesh.org

ABSTRACT

In the southern coastal chars of Bangladesh smallholder vegetable producers often have poor access to quality inputs and technical knowledge needed to increase their productivity and diversify into high value production. The Rural Enterprise Development (RED) Component of the Market Infrastructure Development in Charland Regions (MIDPCR), a project funded by IFAD, the Government of Bangladesh and the Government of Netherlands, aimed to develop national market linkages, add value to produce, and build capacity of smallholder farmers. Led by iDE, RED introduced new ways for producer groups, buyers of locally cultivated agricultural produce, and larger processing companies to do business with small producers in five coastal districts of southern Bangladesh.

The RED Component achieved significant impacts through facilitating commercial production and sales strategies for smallholders, and undertaking strategic interventions to improve the performance of vegetable supply chains. The commercial strategies included identifying and linking poor vegetable producers to productive opportunities in the vegetable sub-sector which can significantly increase their incomes as they access high-value markets and sell value-added produce. Value chain interventions included improving the transportation system for tomato and cucumber supply in Bhola to higher value markets by introducing plastic crates. RED achieved increased crop yields and increased farmer income through using quality inputs, technologies such as the sorgen method (a method of planting in ridges), services and linking with markets. Each farmer increased vegetable cultivation areas from 17 to 26 decimals, providing additional income of some BDT 22,147 per farmer (approximately USD 280).

The data from RED suggests that market-based interventions enable smallholder producers to achieve productivity and income increases necessary in sustainable commercial production.

Survey and evaluation of tomato storage practices in Ilocos province, Philippines

Maura Luisa S. Gabriel , Atis MI. ,Dumaoal AE. And Esteban ZH.
MARIANO MARCOS STATE UNIVERSITY, LLOCOS NORTE, PHILIPPINES
marissa_atis@yahoo.com

ABSTRACT

A survey was conducted in the Ilocos, specifically in one barangay of the City of Batac to document the tomato storage practices of farmers/speculators. Storing tomatoes is already considered as a source of additional income of farmers, aside from farming. Farmers were already storing tomatoes for 5 to 10 years, but most of them experienced storing for one to two years.

Farmers plant their own tomato for storage, using the variety, Ilocos Red. Storing tomatoes is usually done in the month of March, which is the peak of harvesting and where the price is low. Tomatoes are sold two months after storage where the price goes up.

Most of the farmers store their tomatoes in containers that are available and are being used in farming, like bamboo baskets, plastic sacks, sando bags, plastic/wooden box, plastic pail, carton. For plastic sacks used as containers, they are either hanged, laid horizontal or in vertical position. The place of storing tomatoes is in the open space or inside their houses both with roofing made of light materials or galvanized iron. Problems encountered by farmers were fruit rotting and fluctuating prices of tomatoes; perceived rotting percentage of 30% was noted by most of the farmers.

The present storage practices of farmers was improved to lessen the rotting percentage of tomatoes. Evaluation of the storage practices which made use of containers such as plastic sack, bamboo basket and carton was done; singly used and also with the incorporation of rice hay and saw dust. Placing the packed tomatoes in an ambient temperature, the best container identified for storing tomatoes were plastic sack and carton; the best material to be incorporated with tomatoes for storage is rice hay. It is profitable to store tomatoes in carton with rice hay, hanged in plastic sack, hanged in net bag with newspaper and in plastic sack (in horizontal position) and in carton.

Characteristics and performance of tomato industry in Indonesia

Andri K.B
ASSESSMENT INSTITUTE FOR AGRICULTURAL TECHNOLOGY (BPTP) EAST JAVA, INDONESIAN AGRICULTURAL RESEARCH AND DEVELOPMENT (IAARD), MALANG, INDONESIA
kuntoro@gmail.com

ABSTRACT

In Indonesia, tomato ranks amongst the big five of vegetable crops in terms of total production and cultivated area. In addition, many men and women are working or hired in tomato farms and business at different stages along the product chain. This study was conducted to provide a description and analysis of the tomato Industry in Indonesia. Some information and analysis of the tomato chain are also provided due to the close links between tomato production and marketing. A review of existing studies, reports, and government statistics was carried out early on during the research and qualitative methods were employed for collection of primary data. The fieldwork was carried out in January, February and December 2012 using Focus group discussions (FGD) with farmers and semi-structured interviews (SSI) with producers, other chain actors, and some knowledgeable observers in East Java and NTB. This study shows the productivity of tomato is still below the level of potential. Some production constraints encountered due endemic pests and diseases as well as quality of seed. Besides, post-harvest handling is also less of a concern because it is still traditional. Thus there are still opportunities to be able to increase the production of tomato by improving seed genetic resources and farming technologies. Government support is needed for the provision of warehouse facilities in strategic markets and improved transportation facilities to maintain the quality.

Keywords

tomato industry, value chain analysis, cultivation practices, Indonesia

Session 4: Cross-sectoral issues

25 February 2014 (Tuesday)

Lessons learned from implementing nutrition-sensitive agriculture as a platform to improve nutrition and household food security

Haselow N.J
HELEN KELLER INTERNATIONAL, ASIA PACIFIC REGIONAL OFFICE, PHNOM PENH CAMBODIA
NHASELOW@HKI.ORG

ABSTRACT

Global food price volatility, social unrest and increasing inequity have resulted in more people suffering from hunger and increased household food insecurity. Children under the age of five and pregnant and lactating women are at highest risk of resultant vitamin and mineral deficiencies. For almost 25 years, Helen Keller International (HKI) has supported efforts to improve household nutrition through implementation of homestead food production (HFP) programs that simultaneously promote optimal nutrition practices and increase year round availability and intake of diverse micronutrient rich foods among poor households. This paper aims to review the impact of HKI's HFP programs and identify core elements of the HFP model and lessons learned for adaptation and replication.

The HFP program positively impacted poor households' year round food production and availability, particularly for women and children. HFP improved household garden practices, food production, consumption and dietary diversity. Number of crop varieties consumed was significantly increased from a range of 2-3 to 8-9 between baseline and end line among program households. The change in proportion of households consuming eggs and/or liver was higher among program (24% to 46%) than comparison (12% to 18%) households. The median income earned from selling surplus HFP produce increased from US$ 1 to 7 in all programs. Anemia prevalence was lower among children in the program households at endline compared to baseline.

Key elements of successful HFP programs include an evidence-based and participatory program design, practical training package for both agriculture and essential nutrition actions, established local resource centers, tested behavior change communication and advocacy strategy, gender analysis that informs the strategy, links with existing systems, continuous learning system through formative research and process monitoring, staffing that depends on program design, community/ local ownership, documentation, publication and dissemination, minimum duration of technical inputs to ensure impact.

Building capacities and strengthening market integration of small-scale farming systems through a demand-driven approach to technology transfer

Morris S.J
EAST-WEST SEED INTERNATIONAL LIMITED, YANGON, MYANMAR
morris@eastwestseed.com

ABSTRACT

The significance of vegetables as an engine for economic growth in rural areas has long been overshadowed by a predominant focus on rice. However with potential for growth in both domestic and export markets and increasing demands for higher qualities, vegetables offer good opportunities to farming families, many of whom live under the national poverty line, to increase income and reduce dependency on rice. Nevertheless, despite considerable developments in recent years, profitability for many smallholder farmers continues to be hindered as a result of their supply-driven approach to production.

To embrace and benefit from a demand-driven approach, traditional farm practices, commonly used by many smallholders in less developed areas, need significant adaptations to bring in line with market requirements. However, multiple factors affect and hinder adoption of the improved practices which are needed for successful market integration. Alongside numerous institutional and policy constraints, the poor performance of many farmers can be largely attributed to limited access to knowledge and information along the value chain. Improved cooperation and dialogue between value chain actors is seen as a major factor enabling smallholder farmers to act upon specific market signals needed to strengthen the competitiveness of their products and assure their integration into the supply chain. Poor access to inputs, which is commonly cited as a major constraint, is generally overcome by the markets reacting to opportunities which are created in demand driven systems.

There is a general consensus in literature that through the failure to recognize market solutions public extension has often been ineffective, lacked sustainability and failed to offer the services needed to benefit the poor. These negative experiences have inspired considerable debate about the most effective way to provide and finance advisory services in the future. Pluralistic systems of knowledge transfer have become increasingly recognized as a means of the improving efficiency and outreach of extension. With private sector inclusion, both the financial sustainability of advisory services and its alignment to the markets improves considerably.

In an environment where institutions frequently promote farming systems which are more aligned to their ideologies rather than the realities of the market, the provision of embedded advisory services together with the market pull created by traders, can be a more pragmatic and sustainable solution towards demand driven production. Rather than excluding the poor, private sector activities are found to be an equitable source of advice which provide the incentives needed to drive productivity and upgrade qualities in remote rural communities.

Based on the experiences of East-West Seed in the Philippines, Cambodia, and Myanmar, this paper discusses how market based solutions which promote knowledge, the adoption of improved practices as well as effective cooperation between chain actors can make significant impacts towards market integration of smallholder farmers.

Plant factories

Nichols M.
HONORARY RESEARCH ASSOCIATE , MASSEY UNIVERSITY, NEW ZEALAND
m.nichols@massey.ac.nz

ABSTRACT

There will be major constraints in the future for urban and peri-urban agriculture due to the lack of suitable land and of fresh water. As cities increase in size, the need to source food from further away will increase, posing not only transport problems but also post harvest difficulties.

Plant factories offer the potential to produce fresh vegetables close to the centres of population (cities) where they are to be consumed.

Plant factories are sometimes described as vertical farming, with exotic architectural pictures of people and crops in large well lit buildings. Nothing is further from the truth. The plant factory of the future is likely to be a utilitarian building, (maybe even a skyscraper), filled with plants and managed by a minimum of operators.

Plant factories offer the potential to be very efficient in terms of land footprint (an important factor in mega-cities were land will be at a premium) to be water efficient, and to be able to produce crops on demand. Because it is grown in a sealed container it will be possible to use high levels of carbon dioxide to speed up growth, and also much longer periods of photosynthetic lighting. Product will be free from pesticides, and have a very low microorganism count, so will be extremely safe, and not require washing etc prior to consumption.

Studies undertaken using LED lighting, different carbon dioxide levels and different air temperatures will be presented for the growth of both lettuce and cabbage seedlings.

The need for such studies will be discussed, and the long term future of plant factories will be considered.

Research and development on vegetables and mushrooms project of Thailand Department of Agriculture

Linwattana G , At-thalangrong A and In-sung L
HORTICULTURE RESEARCH INSTITUTE, DEPARTMENT OF AGRICULTURE, BANGKOK, THAILAND
LINWATTANA@CHAIYO.COM

Panu-ampai W
CHIANG MAI AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER, CHIANG MAI, THAILAND

Nimkingrat T
SRISAKET HORTICULTURE RESEARCH CENTER, SRISAKET, THAILAND

Payappanon A
OFFICE OF PLANT PROTECTION RESEARCH AND DEVELOPMENT CENTER, KHON KAEN, THAILAND

Chudee K
PRATHUM THANI AGRICULTURE RESEARCH AND DEVELOPMENT CENTER, PRATHUM THANI, THAILAND

Kurubaancherdjid R
SUKHOTHAI HORTICULTURE RESEARCH CENTER, SUKHOTHAI, THAILAND

ABSTRACT

Research and development project on selected vegetables and mushrooms were carried out during 2008 -2011 at the Agricultural Research and Development Center (Chiang Rai, Chiang Mai, Pichit, Phetchabun, Karnchanburi, Sisaket, Khon Khen, Ubon Ratchathani, Nan, Sukothai) under the Horticulture Research Institute, Thailand Department of Agriculture. The project focused on chili, okra, asparagus, ginger, potato, mushroom and other potential vegetables. The general objective is to enhance vegetable industry aiming at sufficiency food security as well as promoting Good Agricultural Practice (GAP). Specifically, the project aims to: 1) generate new vegetable varieties; 2) improve crop cultural practices; 3) promote crop care/protection; 4) promote seed production technologies; and 5) improve post-harvest and processing, consisting of 136 experiments. On farm trial experiments were conducted and analyzed using statistical procedures for agricultural research.

Results showed several new varieties that are ready for testing in major production areas in the country: chili variety (PC042xSK19-2, PC045xSK18-2, PC042xSK24, PC042xSK18-2) that is resistant to bacterial wilt and anthracnose; a new sweet potato variety (SKT3 x PC 226-24) that is high in starch beneficial for the starch industry and ethanol production to address the energy crisis; a new mushroom variety (L1, L5, No7) suitable for different agroecological zones; a new okra variety (PC 001) that is resistant to yellow vein virus; and a new variety of parkia (*Parkia speciosa*) for off-season production. Several cultural practices on selected crops had also been developed, e.g. tissue culture technique for callus formation in asparagus and hollow bulb reduction technique in potato. Likewise, technologies on crop protection, seed production for chili, ginger and potato as well, as postharvest processing/handling on those vegetables were simultaneously released, e.g. free chemical residue in chili and capsaicin extraction methods. These results prominently minimized chemical utilization and promoted GAP in general. In the same time, technologies for on-farm trial on chili, potato and mushroom were also carried out leading to increasing income of the farmers in potato. The project were met the general objective aiming at food safety program on crops in order to standardization farmers by GAP certification and building up plant genetic population for carry on vegetables breeding programme of the DOA.

Role of vegetables in rising food prices in India and its impact on the stakeholders

Singh B
AICRP-VC, INDIAN INSTITUTE OF VEGETABLE RESEARCH, VARANASI, UTTAR PRADESH , INDIA
bsinghiivr@gmail.com

Vanitha S.M
DIVISION OF CROP, PRODUCTION, INDIAN INSTITUTE OF VEGETABLE RESEARCH, VARANASI, UTTAR PRADESH, INDIA
vanitha.gkvk@gmail.com

Singh H.P
DEPARTMENT OF AGRICULTURAL ECONOMICS, INSTITUTE OF AGRICULTURAL SCIENCES, BANARAS HINDU UNIVERSITY, VARANASI, UTTAR PRADESH , INDIA
hpsgautam@gmail.com

ABSTRACT
Through the literature survey and using authentic secondary data sources, this study attempts to understand the role of vegetables in rising food prices in India and its impact on the consumers. This study finds that rising vegetable prices, particularly onions, potato and tomato, have significantly contributed to food inflation in the country. The lower income groups and poor households have been adversely affected by the food inflation, threatening their food and nutritional security. Focus is required in expanding cold chain facilities (3016 cold storages in 20 states at present) for storage, fast moving supply chain infrastructure, increase in processing and value addition facilities and technologies for reducing post-harvest losses, low-cost and high-yielding technologies to increase productivity and profitability, and an efficient marketing system through effective policy interventions satisfying both producers and consumers.

Keywords
Food inflation, vegetables, consumer, food security, India

[**Note**: * Potato may be a staple crop of many countries in the world, But in India it is considered and used as a vegetable. National Horticulture Board (NHB, Government of India)]

The impact of new developments in small-scale vegetable production and marketing systems on food security and nutrition level of Sri Lanka

Dharmaratne T.A.
AGRARIAN RESEARCH AND TRAINING INSTITUTE, COLOMBO, SRI LANKA
hubeiagriculture@yahoo.com

ABSTRACT

Sri Lanka produces more than nine hundred thousand metric tons of over eight different verities of vegetables annually. This sector alone contributes nearly 2.5 percent of the GDP. Vegetable verities are cultivated under various farming systems throughout the year in different regions. Production system is highly affected by seasonal rain falls even though there are two major seasons of cultivations. This paper examines the impact of recent developments in production and marketing systems on food and nutrition security of the island. A number of trends are visible of these developments. New technology packages, green house cultivation, high breed seeds, off seasonal cultivation, contract growing, priority for home garden production, supply oriented production system to market oriented production, emergence of a demand responsive marketing, converting of traditional marketing systems to supermarket chains and reduction of high public sector involvement are a few of these trends. Similarly, some others changes have taken place side by side. Establishment of regional markets, reduction of high uncertainties (quantity, quality, time) at both producer consumer, used of new packaging, cleaning and grading system, execution of new awareness program for vegetable consumption, implementation of national pricing mechanism and dissemination of market information are key change with modifications. Despite of some limits, the contribution of process of recent development and changes of production and marketing for improvement of the level of food and nutrition security has significantly advancement. New cultivation techniques and commercial oriented production and marketing has contributed to enhancement of food security, while upgrading of the production and market accessibility, improvement of the quality and quantity, development of market infrastructure, growth of farm incomes and increase of per capita incomes in populations have significantly expanded the level of "per capita consumption of vegetables" that improving the nutritional requirements of the peoples. "Divinaguma" program first priorities for agriculture in government are the key contributing factors for these successes story.

Keywords

Small farmers, food security, nutrition, production, marketing system

Improving vegetable small farms with marketing partnership

Susilowati S.H and Saliem H.P
INDONESIAN CENTER FOR AGRICULTURAL SOCIO ECONOMIC AND POLICY STUDIES, MINISTRY OF AGRICULTURE, BOGO RINDONESIA
srihery@yahoo.com; handewipurwati@gmail.com

ABSTRACT

Smallholder farmers, including vegetable farmers, are currently constrained with limited capital and lack of marketing network when accessing modern markets to achieve better price. Marketing partnership for vegetable products is aimed at increasing market efficiency, such as improved farm-gate price. Using secondary data and review of research results, the objective of this paper are to: (i) analyze the position of small farms in the Indonesian agriculture sector; (ii)) identify the types of partnership on some particular vegetable commodities; and (iii) identify the role of marketing partnership on increasing small vegetable farmer income. The results indicate that smallholder farmers with less than 0.5 ha comprise 56.6% in Indonesia, and this figure has been increasing since the last decade. There are two types of partnerships, namely formal and informal marketing partnership. Formal marketing partnership is between farmer and supermarket or corporate business, while informal marketing partnership is between farmers and village traders. Case of one vegetable crop showed higher R/C ratio of farmers under formal partnership than non-participating farmers. Marketing partnership on small vegetable farms could be enhanced as long as these partners take notice of market price fluctuations, set sufficient profit to the farmers, give technical assistance up to postharvest, and provide capital assistance or access to capital sources.

Women in vegetable production: A way to empowerment

Singh B
AICRP-VC, INDIAN INSTITUTE OF VEGETABLE RESEARCH, VARANASI, UTTAR PRADESH , INDIA
bsinghiivr@gmail.com

Vanitha S.M
DIVISION OF CROP, PRODUCTION, INDIAN INSTITUTE OF VEGETABLE RESEARCH, VARANASI, UTTAR PRADESH, INDIA
vanitha.gkvk@gmail.com

Singh H.P
DEPARTMENT OF AGRICULTURAL ECONOMICS, INSTITUTE OF AGRICULTURAL SCIENCES, BANARAS HINDU UNIVERSITY, VARANASI, UTTAR PRADESH , INDIA
hpsgautam@gmail.com

ABSTRACT

In India, about 60 per cent of women workers are in agriculture. Nearly 84 per cent of rural women in India depend on agriculture for their livelihood. Literature says around 39% of women participation rate in agriculture is seen in vegetable production alone. Empowerment here refers to provide financial, educational and economic decision-making powers to women farmers. The main objective of the study was to analyze the challenges and opportunities for farm women in vegetable production using primary data. SWOT analysis is done to know the strengths, weakness, opportunities and threats faced by farm women in vegetable enterprise. Women have become an indispensable part of all the activities starting from land preparation, sowing/transplanting, inter-cultivation, harvesting, grading, processing, marketing and cooking tasty vegetable dishes. They also maintain kitchen gardens for sustainable vegetable production for home consumption and thus, maintain the nutritional security of the family etc. Women are also engaged in small- to large-scale vegetable processing and seed production. In rural areas, women perform marketing activities in vegetables. Women immensely contribute in maintaining the country's food and nutritional security, though their contribution is unrecognized and underweighted. Generally rural farm women are illiterate, unskilled and have less decision making power. Most of their works are treated as less paid or family labor. Vegetable production has shorter duration and can provide early economic returns to the farmers. Therefore, it has immense potential to be one of the best suitable remunerative and affordable enterprises which can be taken up by farm women paving the way for socio-economic empowerment. The only focus required is to provide them access to credit needs, suitable vegetable production training programmes, low cost technologies, market access, and extension awareness services.

Key words:

Women empowerment, vegetable enterprise, SWOT analysis

Potential for diversity in tomato pigments for enhancing nutritive quality

Biswas P, Akhtar S, Sikder S and P. Hazra
DEPPARTMENT OF VEGETABLE CROPS, BIDHAN CHANDRA KRISHI VISWAVIDYALAYA, WEST BENGAL, INDIA
hazra.pranab05@gmail.com

ABSTRACT

Tomato is cultivated all over the world and is one of the most consumed vegetables. A typical tomato fruit contains average levels of provitamin A, vitamin C and carotenoids but because of the volume of tomato products that are consumed their dietary contribution to human health is significant. When mentioning the word "tomato" the majority of people usually imagine red colored fruits. As a matter of fact, due to a number of mutant genes, tomato displays diversity in fruit colors ranging from purple, deep red, pink through orange to bright yellow and could offer health benefits related to these colors. However, in some countries, the acceptance of tomato fruits possessing color different than red is slow, because of a kind of consumers conservatism. The present study was designed to examine the nutritive potential of two groups of tomato genotypes: Four genotypes possessing pigment enhancing mutant genes for lycopene (viz., *hp, dg and* og^c) and anthocyanin (*Aft*); Four normal breeding lines of tomato without mutant genes in them. Biochemical analyses showed significant differences in all the nutrient and antioxidant compounds in the genotypes belonging to two groups. The fruits in the genotype possessing the mutant genes, *hp* contained the maximum ascorbic acid content of 40 mg/ 100 g fresh. The fruits in the genotypes possessing the mutant genes, *hp, dg and* og^c contained significantly higher lycopene content compared to the normal breeding lines which ranged between 4.16 to 5.06 mg/100 g fresh. However, the genotype with og^c / og^c mutant gene emerged as the best mutant line as far as overall quality of the fruits is concerned. The maximum anthocyanin content was recorded in the fruits of genotype carrying gene *Aft* (*Anthocyanin fruit*). The analysis of the results obtained showed that immense possibility is left to upgrade the richness of dietary contribution to human health offered by tomato through introgression of three lycopene enhancing mutant genes *hp, dg and* og^c . On the other hand, breeders could contribute to this topic by developing larger number of varieties displaying colors different than red through introgression of anthocyanin enhancing *Aft* gene. These mutants could effectively be employed in breeding tomato hybrids with improved fruit quality. However, some consumers' awareness concerning the benefits of consuming tomato fruits displaying diverse colours may be necessary.

Session 1: Small-Scale Farming Systems

26 February 2014 (Wednesday)

An agronomic and economic study of rain shelter application for tomato production during hot season in East Java, Indonesia

Latifah E and Andri K.B
ASSESSMENT INSTITUTE FOR AGRICULTURAL TECHNOLOGY (BPTP) EAST JAVA, INDONESIAN AGRICULTURAL RESEARCH AND DEVELOPMENT (IAARD), MALANG, INDONESIA
evy_latifah@yahoo.com

ABSTRACT

Production of tomatoes during the hot-wet season in tropical climates is limited by unfavorable conditions such as high temperature, flooding, strong winds and high incidence of diseases. These conditions can significantly reduce tomato yields. Shading will reduce incoming radiation, but it may decrease production or quality. The study aimed to understand the effects of rain shelter application by using the observation parameters, i.e., plant height, leaf number, percent of disease and tomato production. The study was conducted in Kayen Kidul Subdistrict – Kediri district, East Java, using 'Timoty' tomato cultivar, and carried out during the hot-wet season from June to October 2013. Rain shelter design consisted of a structural frame covered with polyethylene film or rigid plastic panels on the top of the structure, screen on the sides and ends, and without active heating, cooling devices and electricity. The study showed that tomato plants protected by rain shelter grew higher and better in terms of number of leaves than without rain shelter. In addition, tomatoes under rain shelter protection had lower TMV viral disease incidence. The study showed that tomato plant that was protected by a rain shelter had higher growth and higher number of leaves produced compared to without protection. This is due to lower levels of solar radiation received under rain shelter, ranging from 400-700 nanometers, as well as aeration, water content, soil moisture and TMV virus attack which are suitable for plants. On the cost and income analysis, tomato with rain shelter required higher cost, but the profit almost doubled compared to without rain shelter due to very high fruit production.

Key words:

rain shelter, tomatoes production, hot season, East Java

Role of vegetable for solving the micronutrient deficiency (the hidden hunger) in Bangladesh

Rahim M.A and Alam M.S
DEPARTMENT OF HORTICULTURE, BANGLADESH AGRICULTURAL UNIVERSITY (BAU), MYMENSINGH, BANGLADESH
marahim1956@yahoo.com

Hashem M.A
DEPARTMENT OF SOIL SCIENCE, BANGLADESH AGRICULTURAL UNIVERSITY (BAU), MYMENSINGH, BANGLADESH

Fakir MSA
DEPARTMENT OF CROP BOTANY, BANGLADESH AGRICULTURAL UNIVERSITY (BAU), MYMENSINGH, BANGLADESH

Ahmad M
DEPARTMENT OF ENTOMOLOGY, BANGLADESH AGRICULTURAL UNIVERSITY (BAU), MYMENSINGH, BANGLADESH

ABSTRACT

Bangladesh has been suffering from serious nutritional food deficiency for long. In a study it was found that out of 140 million peoples of Bangladesh about 1.5m are in hunger (deficient in calories and protein), 40m are in micronutrient deficiency (vitamins and minerals)-the hidden hunger and about 2.5m are suffering from over nutrition (obesity). About 40% children are suffering from Vitamin A deficiency (night blindness) and 35% rural women are also suffering from Vitamin A and iron deficiency (anemia). This situation can be overcome by producing and utilizing vegetables in large scales. Although vegetables production are increasing day by day and almost doubled with introduction of hybrid, improved seeds and heat tolerant lines from AVRDC, but non uniform production times, erratic market system, unplanned production, non target orientate and inconsistency in production pattern lead to a big problem from producer to consumers. Major vegetable productions are concentrated mainly in winter (50%) and in summer (35%) with the minimum production in lean period (Aug-Nov) and (April-May). The present paper mainly deals with the production status, constraint and probable solutions of vegetables in Bangladesh. A production and crops selection model for the lean period has been developed. This model is now successfully being used in southern part particularly saline belts of Bangladesh where vegetables production is scarce. Moreover, a number of antioxidant rich colored potato, sweet potato, sweet gourd, carrot varieties are being registered for growing all over the Bangladesh in collaboration with the University of Wisconsin, Madison, USA under the financial assistance from USDA-ARS. The paper also deals with the present status of production of indigenous vegetables in Bangladesh which are also contributing nutrition and poverty alleviation of our land scarce, malnutrition affected and poor peoples. Bangladesh Agricultural University also established the largest vegetables repository including a number of underutilized, tropical, subtropical, indigenous and temperate vegetables here in Mymensingh. Contribution of the vegetable crops in the nutrition of poor people and to alleviate poverty in coastal, hunger prone (monga) and flood affected areas have also been addressed in this paper. Finally, the paper focuses on the future policy of the managements of vegetable crops in Bangladesh for economy, nutrition, food security, poverty alleviation and sustainable development. Possibility of international collaboration has also been explored in this paper.

Keywords

Bangladesh vegetables, malnutrition, poverty alleviation, national economy, climate change, biodiversity.

Improving supply chain for high value vegetable in Indonesia: The case of vegetable production system by smallholders in East Java

Andri K.B
ASSESSMENT INSTITUTE FOR AGRICULTURAL TECHNOLOGY (BPTP) EAST JAVA, INDONESIAN AGRICULTURAL RESEARCH AND DEVELOPMENT (IAARD), MALANG, INDONESIA
kuntoro@gmail.com

ABSTRACT

Recently, food and agricultural markets are undergoing a rapid transformation towards high value products and modern markets. This rapid transformation presents smallholders with new opportunities to participate in high value supply chain to improve their income. However, there are some challenges as well in producing high value agricultural products such as vegetables. This study aims to investigate the problems and opportunities of vegetable production and marketing in Indonesia. This study was conducted in some major vegetable producing regions in East Java for high value vegetables such as shallot, chili, and tomato. Vegetable's farmers, traders, and agribusiness sectors were interviewed from August to December 2012. The study shows that beside the vegetable farmers have supplied to traditional market through local traders, there is a new alternative channel emerging for vegetable marketing which is supermarket channel. However, this supermarket supply chain is still very small and underdeveloped. The main obstacles faced by production and marketing vegetables are pest and disease, soil fertility, plant nutrition management, post harvest handling, market access and market information such as consumer preferences. As a consequence, the vegetable products are still not able to adapt to the demands of domestic market, especially modern markets such as supermarkets, hotels and restaurants. To improve the supply chain for high value vegetable production it is very important to build partnership between supply chain actors, e.g. cooperatives, to provide training and technical assistance to small farmers and to facilitate market access and information of chain actors. Results from this study highlighted implications for policy makers, particularly technical assistance, for improving the high value vegetable supply chain in Indonesia.

Keywords

smallholders, high value product, supermarket, supply chain, vegetable

Economic and marketing of commercial vegetables in Barangay Banao, Bauko Mountain Province

Depalog N.T. Ligligen S.C.A and Gawec P.M
MOUNTAIN PROVINCE STATE POLYTECHNIC COLLEGE, BONTOC, PHILIPPINES
vicepresidentforrde@yahoo.com

ABSTRACT

Barangay Banao is one of the 22 barangays of Bauko Municipality. There are 18 sitios all adjacent with each other with 347 households. It has a land area of 492.5 hectares. 49.73 percent covering 244.92 hectares as agricultural land, forest cover of 111.108 hectares or 22.56 percent, grass land of 20 percent or 98.5 hectares (except an open area within the watershed), infrastructure and water bodies of 8.077 hectares covering 1.64 percent, 2.12 percent or 10.441 hectares an institution areas while 3.86 percent or 19.0105 hectares as settlement areas. People of this barangay are mostly engage in rice and organic vegetables farming for consumptions. However, there is a significant number of families who are engaged in commercial vegetables. The objectives of this research was to (a) determine the different commercial vegetables planted in Banao, Bauko, Mountain Province, (b) determine the marketing practices of the gardeners of commercial vegetables, and (c) determine the income that could be generated to improve the economic status of the farmers who engaged in commercial vegetables gardening.

The researchers utilized focus group discussion as the main data gathering instrument supported by informal interview with farmers who are engaged in commercial vegetable gardening. Of the 347 households only 35 families are engage in commercial vegetable gardening tilling approximately 10.5 hectares parcel of agricultural land.

The data were taken during interviews and Focused Group Discussions (FGDs) with the farmers of barangay Banao. This is based on the average vegetable area of approximately 3,000 square meters per household engaged with an approximately 10,000 holes with cabbage, Chinese cabbage and bell pepper as the basis. Other major crops planted aside from the above mentioned are Baguio beans, sweet pea, carrots, radish and lettuce. Of the eight major products, bell pepper is the majority product planted from November to May wherein 80 percent of the households are engaged in. From May to August, beans and sweet peas come next with about 60 percent households farming these crops, while 40 percent work on beans. From August to November, farmers engage on wombok (Chinese cabbage), cabbage and carrots. But some gardeners can plant any product at any month within a year.

Commercial vegetables are being transported by trucks mostly at Baguio city market and La Trinidad Trading Post with fare of P2 to P3 per kilo. Sometimes products are being transported by bus at P50 per basket and P20 toP50 per sack. Some farmers bring their products to Isabela and Nueva Viscaya. Low grade produced are sold in Abatan Bauko and the capital town of Bontoc. Prices of products are controlled by businessmen from the lowland provinces usually affected by supply and demand principle.

For the income of these farmers, 15% have income ranging from P80,000.00 to P200,000.00 per annum, about 40% with break-even income and most of them have negative income per annum.

Establishment of model home garden targeting poor women households and HIV victim members in per-urban area

Nibret H
AMHARA AGRICULTURAL RESEARCH INSTITUTE, ADET AGRICULTURAL RESEARCH CENTER, BAHIR DAR, ETHIOPIA
habitt2006@yahoo.com

ABSTRACT

Based on the agreement done between Amhara Agricultural Research Institute (Adet Agricultural Research Center) and Rural Capacity Building Project under the Ethiopian Institute of Agricultural Research (EIAR), the project production of vegetable crops and elevate economic status among poor women headed families in Bahir Dar town was carried out. The home garden model was established based on availability of land more than 100 m2 in their compounds, experience of producing vegetables, access to water source and their economic status. Based on the criteria identified, 15 poor women household headed families were selected. Trainings were given on different agronomic practices of vegetable production and preparation of compost. Seeds of lettuce, Swiss chard, head cabbage, kale and carrot were supplied to each home garden models. The training and experiences gained using different growing structures such as containers and boxes, growing shelf, car tires and FAITH (food always in the house), gardening structures were established to maximize the garden both vertically and horizontally. Through this initiative participants were able to produce higher yields of leafy vegetables. The produce were consumed among the family members and also sold at the local market. Today, these home garden models are used as training center where participants to share their experiences with to the local communities. Therefore, continuous technical and financial support should be made to strengthen the establishment of home garden model and training center to reduce poverty and increase better nutrition intake for better life.

Studies in response of onion (*Allium cepa* L.) to various levels and sources of sulphur

Chattopadhyay S, Santra P, Manna D , Behera and Maity T.K
DEPARTMENT OF VEGETABLE CROPS, BIDHAN CHANDRA KRISHI VISWAVIDYALAYA, WEST BENGAL, INDIA
shubhomita.c@gmail.com

ABSTRACT

Onion (*Allium cepa* L.) is one of the most popular bulb vegetables and also commercially important vegetable worldwide. The continuous adaptation of sulphur free fertilizer regime in recent years coupled with decreased atmospheric input of sulphur has lead to a marked increase in the incidence of sulphur deficiency in the crops. To assess the impact of sulphur in onion (*Allium cepa* L.) a trial was conducted on cultivar Sukhsagar at 'C' Bloock Farm, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, during rabi season. The treatments were comprised of four levels of sulphur (0, 15, 30 and 45 kg/ha) which were given as basal application from two sulphur sources viz. gypsum and as elemental sulphur. There were eight treatments laid out at factorial randomized block design and replicated thrice. The produce obtained was further kept for four months storage in low cost storage structure and observations were recorded for physiological loss in weight and losses due to rotting and sprouting. The result revealed that significant highest total yield (298.81q/ha) and marketable yield (272.13 q/ha) were recorded with application of elemental sulphur given @ 30 kg/ha. The highest amount of pyruvic acid content in bulb (4.5µmol g-1) and minimal storage loss were also found from the same treatment. Thus the study suggested that the use of soil application of elemental sulphur @ 30 kg/ha enhanced the yield and shelf life of onion cultivar Sukhsagar under new alluvial zone of West Bengal

Session 2: From Seed to Harvest

Parallel session 2a: Germplasm and breeding

26 February 2014 (Wednesday)

Developing methods to screen for heat tolerance in sweet peppers (*Capsicum annuum* L.)

Shieh H.C, Lin S.W and Kumar S
AVRDC – THE WORLD VEGETABLE CENTER, PO BOX 42, SHANHUA, TAINAN 74199, TAIWAN
jin.shieh@worldveg.org; susan.lin@worldveg.org; sanjeet.kumar@worldveg.org

Hsieh C.H
PLANT INDUSTRY OF NATIONAL PINGTUNG UNIVERSITY OF SCIENCE AND TECHNOLOGY, 1, SHUEFU ROAD, PINGTUNG, TAIWAN
hsieh@mail.npust.edu.tw

ABSTRACT

Heat stress is an important abiotic factor that adversely affects the growth of sweet pepper (*Capsicum annuum* L.*)*. Field trials in summer (March-August 2010) and fall (September 2010 -February 2011) were conducted in Taiwan to screen 16 sweet pepper accessions under high and normal temperatures (28.4 ^{o}C and 22.5 ^{o}C in 24 hr mean, respectively). Summer yields showed higher variance (σg) and broad-sense heritability (Hb) than fall yields, which indicates the potential for better selection during summer. In vitro pollen germination and tube growth were tested under wide temperature regimes (27–40 ^{o}C). Pollen germination and tube growth were significantly reduced at 36 ^{o}C–40 ^{o}C, and pollen germination and pollen tube elongation at 36 ^{o}C showed the highest variance and broad-sense heritability. It is thus suggested that 36 ^{o}C is the critical temperature to differentiate heat-tolerant and heat-susceptible lines. Eight of 16 lines showed consistent high pollen viability and yield at 36-40 ^{o}C, which indicates pollen viability at high temperatures could be used as a screening method for heat tolerance. Root studies were measured at four stages. Significantly high correlations (0.52-0.89) between plant and root parts were found at every stage. Lower correlations between fruit and root parts (0.13-0.69) were also found. At stage 3 (88 days after transplanting, DAT) and stage 4 (110 DAT), correlations between plants with roots and between total plants with roots was 0.7-0.9. The plant above root (shoot and fruit) was significantly correlated with the root. Based on our results, the use of regression to predict root development from plant and fruit growth may be feasible.

Seed health: Innovations and best practices from the private sector

Mehta P
EAST WEST SEED INTERNATIONAL LIMITED
prem.mehta@eastwestseed.com

ABSTRACT

Seed quality and seed health is increasingly becoming more important in the Global Seed Industry, especially in tackling seed borne diseases. Seed Health refers to the presence or absence of disease-causing organisms such as bacteria, fungi and viruses including insects and nematodes.

In order to produce and supply disease-free seeds to local and high value global markets, private seed companies are recognizing the importance of and becoming ever more focused on seed health management. The establishment of a comprehensive seed health program in a private seed company is vital because:

- The diseases initially present on the seeds may give rise to progressive disease development in the field and consequently reduce commercial value of the crop affecting income and livelihood of the farmer.
- Importation of seed from other regions/countries may introduce diseases or pests in new regions/locations

East-West Seed, market leader for tropical vegetable seeds, has successfully established and implemented a comprehensive Seed Health Management (SHM) program. The SHM program is applied to both upstream (Breeding and Foundation Seed) downstream (Stock Seed and Commercial Seed) operations.

The Seed Health Management Program is designed to produce high quality and healthy seeds free from infection of serious seed borne disease. This is in compliance with international regulations to support the local and high value global seed markets.

The SHM functions consist of the following initiatives:

- Field Sanitation Practices
- Field Phytosanitary inspections
- Seed Disinfection
- Detection of seed borne diseases
- Seed treatments
- Comprehensive trainings

As part of the SHM program, East-West Seed has successfully implemented a comprehensive seed disinfection program in which most of the commercial seeds are disinfected before delivered at the plant for further processing. The disinfected seed is then sent to seed health lab for conducting detection tests to confirm the seed is free from seed borne pathogens.

With the establishment and monitoring of a solid seed health management program and practices, private seed companies can provide good quality and healthy seeds to farmers which can further enhance farmers' income and provide opportunities for sustainable growth in the vegetable sector.

Spine gourd: The golden vegetable of western Ghats

Basavaraja N. , Patil S.V., Chandan K. and Shivanand H
COLLEGE OF HORTICULTURE, SIRSI, UTTARA KANNADA DIST, KARNATAKA, INDIA
nbraja2010@gmail.com

ABSTRACT

The cucurbitaceae is one of the largest family containing more than 125 genera and 960 species and spread all over the world. The family members are well adoptable to varied agro climatic regions starting from temperate to tropical and from sea level to 3000 m from MSL. One such vegetables is spine gourd/sweet gourd (*Momordica dioica ssp sahyadrica* nom.) which is widely grown in Western Ghats (800-1800 MSL) of Southern India

According to Joseph *et.al.,* (2007) the origin of *Momordica dioica ssp sahyadrica* might be of western ghats as many variations are found around this region in thickest and secondary forests with an altitude of low and medium receiving 1200 to 3500 mm rainfall annually having RH >80% throughout the year. Majority of the crop comes to the market from wild collection by the native tribal people and gets a premium price in the market (₹.250 to ₹.350/kg) due to its scarcity and for medicinal properties. This is also locally called as "Malanada Honnu" (Golden Vegetable of Western ghats).

The crop is most sought by the people due to its non-bitterness at immature stage and red lycopene and carotenoid contents at full mature stage. The roots of spine gourd are also being used for treatment of piles, urinary and bowl infections and believed to have growth stimulating substances which will promote health, vitality and longevity of human beings. However, this crop is not being given much importance all these days as the yielding level is poor due to its dioecious nature.

Hitherto this crop is grown in a wild farm and in backyards of farmers of Western Ghats. However, systematic studies are not being conducted to make the crop as commercial crop.

Hence, an attempt is being initiated at College of Horticulture, Sirsi (Right in the centre of western ghats) to study the following aspects on spine gourd – *viz.,*

- Exploration, collection, characterization and maintenance of germplasm.
- Standardization of production technology (including pest and diseases)
- Standardization of propagation techniques.
- Use of chemicals ($AgNo_3$) and growth regulators for altering the sex ratio
- Assisted pollination and dormancy related studies.
- Medicinal properties and value addition.
- Enhancing its status from under-utilized to **commercial status** in south India.
- Collaborative research with other institutes in India and abroad

The preliminary studies revealed that each spine gourd female plant bears 100-150 female flowers during a period of 100-120 days, hand pollinated plants had increased the setting up to 75%, each plant has produced 13-14 fruits at first harvest. The fruits at maturity stage measures from 68-73 mm in length and 33-36 mm in diameter with average weight of 24 to 27 grams having 30-45 seeds per fruit. Each fruit has taken nearly 22-26 days for maturity.

Minerals content of yam (*Dioscorea* spp.) tuber parts during its growing process

Degbeu C.K , N'dri Y.D and Amani N.G
UNIVERSITY OF NANGUI ABROGOUA, FACULTY OF FOODS SCIENCES AND TECHNOLOGIES, LABORATORY OF BIOCHEMICAL AND FOODTECHNOLOGY OF TROPICAL PRODUCTS, ABIDJAN, CÔTE D'IVOIRE
kouadc@yahoo.fr

ABSTRACT

Yam (*Dioscorea* spp.) is a staple food for the population of developing countries. It is widely consumed by the population for its high energy value and ability to be transformed into various forms. For these applications, the distal part which is not suitable for cooking is thrown. Also, the tuber maturity according to the nutriments content does not coincide generally with the harvested time when the leaves start drying off. The aim of this study is to find out the nutritional value of yam tuber parts during its growth process.

Two varieties of *Dioscorea cayenensis*: kponan and kangba were cultivated in an experimental farm at Abobo-adjamé University (Abidjan, Côte d'Ivoire). Yam tuber pieces of 754 g were planted in nursery gardener sachet (40 cm x 40 cm), filled up with soil enriched with manure (pig droppings) and arranged (1 m x 0.5 m). Six tubers were harvested randomly at 16; 18; 20; 22; 24 and 26 weeks after planting date. Each tuber was measured and sectioned into three parts (proximal, middle and distal). Each lot of tuber part was transformed into flour then incinerated into ash. The chemical composition of the ash was assessed by microanalysis on selection of energy, coupled to a scanning electron microscope (Zeiss Supra 40 VP, Germany).

The mineral content of each part of the tuber could be subdivided into three groups on their contain basis: the abundant minerals (K and P), the minor mineral (Na, S, Mg, Cl, Ca and Si) and trace elements (Zn, Cu and Fe). The amount of P (15.2% to 8.52%) and K (44.4% to 32.2%) decreased during the growing period in each portion of the tuber ($p < 0.05$) for kangba variety. Concerning var. kponan, the general tendency was an increase in the amount of phosphor for the proximal part (6.69% to 14.9%). A weak decrease was observed for the median section and no variation for the distal part ($p < 0.05$) except at week 22. At period 18, the distal and median parts showed respectively a high content of potassium (53.1% and 49.8%)

The mineral content was higher appreciable at maturity than at earlier stage of the tuberization. The important mineral according to their content are: K, P, Mg and S.

Evaluation of Turkish tomato lines on high temperature condition

Ata A. , Keles D and Pinar H
HORTICULTURAL RESEARCH STATION, ERDEMLI/ MERSIN, TURKEY
atillaata@hotmail.com

Rastgeldi U
GAP AGRICULTURAL RESEARCH INSTITUTE SANLIURFA TURKEY

ABSTRACT
Tomato is one of the most popular and widely consumed vegetables grown worldwide and it was growing broad area in the world. Tomato is sensitive to high temperature. High temperature may have adverse crop production especially 35 0C and above. Tomato is less fruit set and it reduced fruit weight in high temperature conditions. Breeders aim to develop new tomato varieties that are resistant to abiotic stress conditions in recent years. In this study, indeterminate tomato genotypes were planting in open field in June in Sanliurfa that province is one of the hottest places in the summer in Turkey.. . It was taken number of flowers and holding of fruits between 15 July and 15 August . İt was calculated ratio of fruit set. This fruits were harvested and obtained total yield for every genotypes. As a result fruit set rates varied between 0 -60 %. The highest total yield was obtained from the Alata 304-2 genotypes. 6 genotypes were selected to tolerant high temperature.

Keywords
high temperature, breeding

Introgression of begomovirus and early blight resistance genes from *Solanum habrochaites* LA-1777

Sadashiv A.T.
INDIAN INST OF HORT RES, BANGALORE, INDIA
atsbrs@yahoo.co.in

ABSTRACT

Tomato (*Solanum lycopersicum L*) is one of the major vegetable crops cultivated all over the world. It occupies an area of 4.58 million hectares with a productivity of 32.8 tons per hectare. In India it occupies an area of 0.86 million hectares with a productivity of 19.5 tons per hectare. Low productivity in India is due to the occurrence of various biotic and abiotic factors. Among the biotic factors are virus diseases caused by whitefly transmitted geminivirus, bacterial wilt caused by *Ralstonia solanacearum* and early blight caused by *Alternaria solani* are the major production constraints. The yield loss between 70-100 % has been reported from these diseases. Adoption of multiple disease resistant varieties /hybrids will be the most practical way to address this problem. ~~On~~ Artificial screening of IIHR-2101 (*Solanum habrochaites* LA-1777*)* was found to possess high level of resistance to Tomato Leaf Curl Virus (ToLCV) and early blight. With a view to introgress genes conferring resistance to ToLCV and early blight an interspecific hybrid (SH1) was developed by crossing a bacterial wilt resistant line (IIHR-2843) with IIHR-2101. BC1F1 was developed by back-crossing IIHR-2843 with SH1 and forwarded to BC1F2. A total of 300 BC1F2 plants were artificially inoculated in a sequential manner against ToLCV, bacterial wilt and ~~&~~ early blight. Individual plant selections were made in BC1F2 for triple disease resistance to ToLCV, early blight and bacterial wilt. Individual plant selections were further advanced to BC1F1 to develop advanced breeding lines *viz* 26-9-2-35-8-3-3, 26-9-33-4-4-3-3, 26-9-2-35-5-3-7 with triple disease resistance to ToLCV, bacterial wilt and early blight. Molecular markers linked to ToLCV (Ty-2) and bacterial wilt resistance were also employed to confirm resistance to ToLCV and bacterial wilt. Resistance to early blight was confirmed by detach leaf method in all the three lines. Further, IIHR-2101 was also found to be resistant to Tomato Leaf Curl New Delhi Virus (ToLCNDV), indicating the presence of an additional gene conferring resistance to ToLCNDV in IIHR-2101. Reported molecular markers linked to ToLCV resistance in tomato have been employed to screen resistant parent (IIHR-2101), interspecific hybrid (SH-1) and segregating population (BC1F1). BC1F2 plants were also raised to isolate plants carrying Ty genes in homozygous form to study their effect on level of resistance to ToLCV.

Breeding for virus resistance in squash

Maghirang R.G , Dolores L.M , Flores M.B, Alcachupas A.L , Dacumos C.N and Gonzales M.C

CROP SCIENCE CLUSTER-INSTITUTE OF PLANT BREEDING, COLLEGE OF AGRICULTURE, UNIVERSITY OF THE PHILIPPINES LOS BANOS, LAGUNA, PHILIPPINES

cndacumos@gmail.com

ABSTRACT

Squash (*Cucurbita moschata* Duch.) is among the most important vegetable in the Philippines with a production area of 12,868 hectares and a production volume of 222,584 metric tons in 2012. Among the major production constraints are infection by viruses such as *Zucchini Yellow Mosaic Virus* (ZYMV) and *Papaya Ringspot Virus-type W* (PRSV-W). Local varieties cultivated are generally susceptible and host resistance is still the simplest, most effective and efficient means of control.

Thirty-one (31) accessions of squash obtained from the AVRDC – The World Vegetable Center were evaluated for resistance against ZYMV and PRSV. However most of these accessions were not adapted to the hot, humid tropical conditions (14°10′N 121°13′E). Fruit setting is low and accessions such as AVPU 1210, AVPU 1223, AVPU 1224, and AVPU 1227 were highly susceptible to cucurbit beetle (*Aulocophora similis*). Only three accessions were selected with relatively good fruit characters: AVPU 1206, 1212 and 1230. The AVPU lines with virus resistance and good fruit characters were crossed to local selections to recombine the desirable traits from the two groups of germplasm. The segregating lines are being evaluated under low-input organic conditions.

Ethnobotany, conservation and promotion of indigenous vegetables in Ilocos Norte, Philippines

Antonio M.A
RESEARCH AND DEVELOPMENT DIRECTORATE, MARIANO MARCOS STATE UNIVERSITY, CITY OF BATAC, ILOCOS NORTE, PHILIPPINES
menisaantonio@yahoo.com; rddirectorate@yahoo.com

ABSTRACT

A survey of indigenous vegetables (IV) was conducted in the province of Ilocos Norte, Philippines, geographically located in the northwestern corner of Luzon Island. The generated information include the IVs' taxonomic classification, socio-economic importance, ethnobotany and geographic location. A total of 36 IVs representing 20 plant families were identified. Majority of them are wild species; and a few are native varieties of cultivated crops. These species contribute to food sufficiency, nutrition and supplementation of household income in the study sites.

The collection sites varied in terms of geographical location, geomorphology, climate, site characteristics, land use and vegetation cover. Cluster analysis based on these characteristics showed three distinct groups of habitats named as HEH, MEH and LEH. HEH consisted mainly of high-elevation sites with steep slopes mainly under pine type forest and a Type III climate. MEH included the mid-elevation collection sites with flat to steep slopes and under dipterocarp and molave forest types and grassland areas, with Types III and I climate. LEH included the low-elevation collection sites with flat to steep slopes and under varied land uses. Variations in temperature, rainfall/soil moisture regime and elevation in the habitats contributed to the variation in IV species richness among the collections sites as well as to the uniqueness/specificity of a species in one or two sites. Many of the IVs, however, showed adaptability to a wide range of geomorphic and soil condition.

Despite their recognized benefits, there is still little effort to conserve and safeguard them. Present conservation efforts of the local residents are not sufficient and there is no known government initiative in the province that conserves or protects these plants and their habitats. Identifying these plants, characterizing their habitats and maintaining collected germplasm *ex situ* were MMSU's initial strides for their conservation, promotion and uplifting their utilization from basically subsistence to commercial level. Several promotional activities to enhance people's awareness and appreciation of the IVs, thereby encouraging them to become partners in the conservation of these resources were undertaken. Additionally, several policy recommendations encouraging collaborative efforts and interventions among various stakeholders were drafted.

Session 2: From Seed to Harvest

Parallel session 2b: Sustainable production

26 February 2014 (Wednesday)

Organic vegetables in Asia

Houtman R
FAO REGIONAL OFFICE FOR ASIA AND THE PACIFIC, BANGKOK THAILAND
ralph.houtman@fao.org

ABSTRACT

The presentation will highlight the outcomes and proposed action points that were identified during the recently conducted Asia-Pacific Regional Symposium 'Entrepreneurship and Innovation in Organic Farming' Organized by the Food and Agriculture Organization (FAO) and the International Federation of Organic Agriculture Movements (IFOAM) 2-4 December 2013, in Bangkok. These cover the areas of research, finance, marketing and logistics, certification, taxes and subsidies and issues of dissemination and communication.

The presentation will also present the outcome of some case studies and consumer research that has been conducted in Asia and that highlight the potential, and some of the pitfalls, of organic farming in general and organic vegetable farming in particular. The presentation will conclude with a brief overview of the PGS (Participatory Guarantee System) web-based tool "GRECOCOS" that was designed to link groups of (organic) farmers to groups of consumers.

Managing soilborne and virus diseases in cucurbits through eco-friendly approaches

Dutta O.P
RESEARCH AND DEVELOPMENT UNIT, NAMDHARI SEEDS PVT. LTD., KARNATAKA, BANGALORE, INDIA
opdutta@hotmail.com

ABSTRACT

The risk associated with complex soilborne and virus diseases in cucurbits is quite alarming. Since effective chemical control measures are not available, farmers incur the highest production losses. . Among the diseases, Fusarium wilts of melon, watermelon and cucumber are the most damaging in India with the Zucchini yellow mosaic virus, Cucumber mosaic virus, Papaya ring spot virus and Water melon mosaic virus as the principal pathogens affecting these three vegetables. These viruses are transmitted by aphids in a non-persistent manner. In addition, the bud necrosis of watermelon (Tospo group of virus) transmitted by thrips is another serious disease of watermelon in southern India. Developing varieties with multiple resistance to soilborne fungi and virus diseases is time consuming and capital intensive. One immediate short-term and successful approach is the use of grafting techniques using bottle gourd and squash (*C. moschata* X *C. maxima*) as rootstocks, followed by covering the grafted seedlings with acryl net after transplanting in field. Reflective plastic mulch keep the vectors away. At flowering, the acryl net is gradually removed to ensure pollination and fruit setting. Once the fruit setting commences, it acts as a strong sink for the photosynthate restricting the rate of growth of vine as well as virus multiplication. Since virus usually multiplies in the growing young tissues of the plant and not in older leaves and appear on the young shoots after the incubation of two weeks, early varieties with basal fruit bearing habit thus escape the damage caused by virus leading to a successful harvest. Steps in making the successful graft and its nursery management along with the use of acryl net in the open field will be projected.

Protected cropping in vegetables

Nichols M
HONORARY RESEARCH ASSOCIATE , MASSEY UNIVERSITY, NEW ZEALAND
m.nichols@massey.ac.nz

ABSTRACT

Currently 70% of the world's fresh water is used in agriculture, and not very efficiently. As the population increases (from the current 7 billion to a predicted 11 billion by 2050, and a possible 25 billion by 2150) greater demands will be placed on this limited resources by both industry and for domestic use particularly with the trend towards larger and larger cities. It is essential that agriculture uses this resource efficiently, and in vegetable production this will mean using protected cultivation and hydroponics.

Fertilizer is another resource used inefficiently, and in the case of potassium and phosphorous are both non-renewable resources. Protected cultivation has a large number of advantages over field production, the major one being that the crop is insulated from extreme conditions, which may be biotic, or may be climatic. For example in Morocco plastic greenhouses are covered in a very fine mesh which excludes most (if not all) insect pests. In other situations protected cultivation may involve simple rain covers, which can reduce the incidence of disease. The result in both cases is an increase in productivity, with automatically an increase in yield per liter of irrigation water. Protected cropping also has the potential to direct the rain falling on the "greenhouse" into a reservoir for later use in irrigation.

Urban and peri-urban agriculture has potential problems due to unsuitable soils within the urban area, or due to soil pollution from pesticides or heavy metals. Combining protected cultivation with hydroponics provides the opportunity to further increase productivity, with the added advantage of having a product which is much cleaner (lower microorganism count) than a soil grown product. By using a recirculating hydroponic system both water efficiency and fertilizer use efficiency is greatly enhanced, with minimal damage to the environment. The ultimate in protected cropping is the "plant factory", and this will be the subject of another presentation.

Sprouts and microgreens - a homestead vegetable production option to enhance food and nutrition security in the rural-urban continuum

Ebert A.W and Yang R

AVRDC – THE WORLD VEGETABLE CENTER, P.O. BOX 42, SHANHUA, TAINAN 74199, TAIWAN
andreas.ebert@worldveg.org

ABSTRACT

Traditional vegetables and vegetable legumes can be a source of readily available daily sustenance when grown in home or kitchen gardens. Lower income groups that lack access to or cannot afford global vegetables or animal protein sources would benefit greatly from the increased availability and consumption of traditional vegetables. Phytonutrient levels of edible parts differ according to the growth stages of the plant and often decrease from the seedling (sprout or microgreen) to the fully developed stage. Sprouts and microgreens can easily be grown in urban or peri-urban settings where land is often a limiting factor, either by specialized vegetable farmers or the consumers themselves. Given their short growth cycle, sprouts and microgreens can be grown without soil and without external inputs like fertilizers and pesticides, around or inside residential areas. Seedlings from semi-domesticated or even wild species typically have high levels of phytonutrients, good flavor, and tender texture. Several crops or different varieties of the same crop can be mixed to create attractive combinations of textures, flavors, and colors. As sprouts and microgreens are usually consumed raw, there is no loss or degradation of heat-sensitive micronutrients through food processing. AVRDC is currently studying potential differences in the levels of essential micronutrients, bioactive compounds, and consumer preferences of selected traditional vegetables (amaranth, mustard, radish) and vegetable legumes (mungbean, soybean) at different growth and consumption stages. The phytonutrient content is being assessed at three stages: (a) sprouts, (b) microgreens, and (c) fully grown plants. The comparison includes landraces from the AVRDC Genebank, modern breeding lines, and commercially available cultivars. This may expand the use of genebank materials for specialty produce such as sprouts and microgreens with great potential to improve food and nutrition security for people living in urban and peri-urban settings.

Keywords

traditional vegetables, vegetable legumes, sprouts, microgreens, food and nutrition security, rural-urban continuum

Management strategies evaluation for the control of the leafhopper, *Amrasca biguttula* and associated insect pests attacking *Hibiscus esculentus* L. for export sustainability of green okra from the Philippines

Agsaoay M.V and Briones R.C
TARLAC COLLEGE OF AGRICULTURE, CAMILING, TARLAD, PHILIPPINES

ABSTRACT

Management strategies for the control of the leafhopper, *Amrasca biguttula* and associated insect-pests attacking okra, *H. esculentus* L. were evaluated for two phases of studies from 2009-2012. It aimed to determine the critical population level of major insect pests as influenced by time of planting, establishment of critical pest level of identified insect pests causing damage on the crop, phenological forecast on emergence of larvae/nymph, damage indices and evaluation of selected pesticides based on maximum residue limit.

Feeding tests of insect pests with their hosts were conducted in a net house with sufficient batches of trials which had established the critical pest levels of insect pests. *Amrasca sp*. and *Dysdercus cingulatus* were observed with high population density during dry seasons planting of 2009-2010, while *Spodoptera litura* registered a population mean ranging from 11.75 to 23.66, regardless of observation sites. High population of *Amrasc*a sp. was evident in January up to April of every planting season. Based from gathered insect pests population, dry seasons of planting years would entail significant damage of the crop if critical population threshold is left unattended. With a series of feeding interaction tests for *Amrasca biguttula*, its critical population threshold level was established with a ratio of 45.53 insect pests per 50 plants with an allowable yield reduction threshold of 0.05 percent (%). Phenological forecast on the hatchability of the eggs of two major insect pests; *Amrasca biguttula* and *Dysdercus cingulatus* were found correlated with temperature while *A. biguttula* was observed correlated with crop age and temperature. Sampling method coupled with critical pest level-based chemical control showed the best strategy for the control of major insect pests of okra observing recommended dosage and time of application. Frequency of chemical application was contained with 10 days minimum interval application compared from the established MIA of 7 days, thereby the maximum residue limit (MRL) of 0.70 ppm was maintained for green export and local consumption.

Keywords

Green okra export, Heliothis armigera, Spodoptera litura, phenological forecast, pre-harvest interval, maximum interval application

Effects of accumulation of lead and macro-nutrient content of vegetables planted in an urban area in Ibadan, Nigeria

Fadina O.O and Omole T.
DEPARTMENT OF CROP PROTECTION AND ENVIRONMENTAL BIOLOGY, UNIVERSITY OF IBADAN, NIGERIA
bunmiofad@yahoo.com

ABSTRACT

The combination of fossil fuel and motor traffic exhaust constitutes a major source of pollution in many parts of the world, especially in urban areas of the developing countries, where leaded fuel is still in use. The accumulation of Lead in three leafy vegetables grown in different traffic density areas was investigated. Also, the effects of lead on the magnesium content of *Amaranthus cruentus, Corchorus olitorius* and *Celosia argentea* were studied. The vegetable samples were analyzed for Lead concentration and Magnesium content using atomic absorption spectrophotometric techniques. The results revealed that *A. cruentus* had the highest lead concentration (13.75mg/l) in the leaves. *C. olitorius* had the least concentration of (1.25mg/l). The observed results also showed that *A. cruentus* had the highest Magnesium content (12341.25 mg/l) in the leaves and *C. olitorius* had the least (3150.75mg/l). This study further revealed that leaf morphology (particularly broad leaf) affects the accumulation of heavy metals as seen in *A. cruentus* when compared to the other two vegetables. Lead accumulation did not show a clear relationship with Magnesium content of the vegetable species; the observed variation in the Magnesium content could actually be the effects of pH of the soil in the sampling site. Therefore, the study suggested that vegetable farms in Urban settlements should be sited in locations far from high density traffic areas, as this would reduce the quantity of heavy metal effluents deposition on plants which many subsequently find its way into the food chain and possibly affect the pH of the soil.

The organic agriculture food chain of Camarines Sur, Bicol, Philippines

Canning M.C.M
COLLEGE OF ECONOMICS AND MANAGEMENT, CENTRAL BICOL STATE UNIVERSITY OF AGRICULTURE, CAMARINES, PHILIPPINES
crescane@gmail.com

ABSTRACT

The growing concern for safe and healthy food coupled with the desire to promote a healthier lifestyle has prompted an increase in the production and consumption of organic food and produce in Camarines Sur for the past two decades. Organic products are becoming one of the growing segments of the food market. In Camarines Sur, the number of organic farmers is increasing. A parallel development is the noticeable increase in the number of organizations and People Organizations (Pos) supporting organic farming. Organic farmers are starting to carve a niche for their products and a growing number of farm products are being produced organically.

This research examined the recent changes which took place in the organic produce chain as well as provided an overview of identified commodity chains. Further, the research identified, described and traced supply chain maps and identified specific activities and services from suppliers to the end customer, and analyzed the performance of particular supply chains including the external influences on the chain and provide policy recommendations to improve the commodity industry. Survey method, focused group discussions and case analysis of farmer-adopters and institutions was done to generate identify the specific activities done by supply chain players as well as trace the food chain from the production sector to the consumer sector. The growth of the organic agriculture sector in the province started with a particular cooperative pushing for the production of organic rice and promoting its consumption to the local market and buyers. The intervention and active support of the non-government sector was highly visible during this stage. Eventually, other farmers started organically producing not only rice but vegetables as well. These farmers have also started joining groups and associations to help them in the marketing of their products.

At present, the organic product supply chain is dynamic and it is evolving. Moreover, the development in the local organic product organic supply chain is being pushed further through the initiatives of Government Organizations, Local Government Units, and NGOs.

Session 3: From Harvest to Table

26 February 2014 (Wednesday)

Scaling up technologies for small scale vegetable farming systems in Southeast Asia

Rolle R.S
FAO REGIONAL OFFICE FOR ASIA AND THE PACIFIC, BANGKOK THAILAND
Rosa.Rolle@fao.org

ABSTRACT

Food systems across South East Asia are shaped by a number of forces. These include the need to feed growing populations, rising living standards and changing diets, a growing scarcity of land and water resources, the threat of climate change, high levels of post-harvest losses and the growing problem of food waste. If not properly managed, these forces could negatively impact on the region's food and nutrition security. Across the South East Asian Region, two major categories of supply chains operate in parallel – modern and traditional supply chains. Modern supply chains are market driven, make use of post-harvest technology, and are focused on delivering high quality produce that is safe to supermarkets, institutions and the food service sector, as well as to producing for export. Stakeholders in these chains are often linked to private sector through contracts and benefit from inputs, technology, assured markets and training. Post-harvest losses in these chains are comparably low.

Post-harvest losses in the traditional supply chains that supply the vegetable requirements of mass markets in South East Asia, on the other hand, are high, ranging from 15 – 50 percent. Underlying causes of post-harvest losses in these chains include the limited knowledge base of stakeholders, coupled with a lack of production planning, pest infestations and diseases, poor and inadequate infrastructure such as roads, water, power and market facilities, lack of post-harvest specific infrastructure such as pack-houses and particularly cool and dry storage facilities, the lack of dedicated transport systems for produce and poor quality bulk packaging that results in damage. Studies recently conducted in two South East Asian countries, determined that consumer level waste of vegetables purchased in both supply chains, results largely from the failure of consumers to eat or cook purchased produce owing to rotting and or decay followed by softening and/or over-ripening. These findings seem to suggest that the lack of meal planning is an underlying cause of vegetable waste in the region..

Post-harvest losses and food waste reduce food availability, increase the cost of food and represent a waste of calories and nutrients, thereby negatively impacting on the food security of poor and vulnerable groups. In addition to discussing the above, the paper will highlight examples of FAO's on-going work in the region geared toward building capacities to reduce losses in modern and traditional supply chains, as well as FAO's awareness raising and advocacy initiatives on reducing food losses and food waste through the Save Food Asia-Pacific Regional Campaign.

Improving the value chain and linking the market for vegetable growers in Bangladesh

Rahim M.A
DEPARTMENT OF AGRICULTURE, BANGLADESH AGRICULTURAL UNIVERSITY (BAU), MYMENSINGH, BANGLADESH
marahim1956@yahoo.com

ABSTRACT

The demand for food in Bangladesh and around the world is changing rapidly. Driven by economic growth, rising incomes, and urbanization, demand is shifting away from traditional staples toward high-value vegetables commodities. In Bangladesh, additional demand for these commodities is projected to be worth about $10 billion by 2020. More than 80% of people living on less than $2 a day in Bangladesh live in rural areas. This spatial distribution of poverty makes capitalizing on the opportunities afforded by high value fruit production an important strategic priority for those seeking to reduce poverty in the country. Insufficient processing capacity, the lack of cold storage facilities or a functioning cold chain, and the persistence of transport bottlenecks are significant constraints to high value vegetables in Bangladesh. The promise of generating higher income and increased export revenues by accessing international markets is matched by the challenges of meeting the exacting quality and safety standards that apply in those markets -- and by the prospect of having to compete with high quality imports from those markets. Some of the major vegetables of Bangladesh have limited processing leading to value addition but most of the vegetables don't have any processing or value addition. Recently, a number of agro-processing industry processing Bangladeshi vegetables in various forms for marketing in the home and to some extent to export. Most of farmers don't have adequate knowledge on value addition as well as processing facilities. The paper mainly deals with the present status, value addition, processing and marketing of vegetables in Bangladesh. Suggestions were also made on the improvement of the vegetables value chain, market access and house hold income.

Vegetables to go school in Southeast Asia and Africa: Training of Trainers Workshop design and implementation

Palaniswamy U.R , Schreinemachers P, Hughes Jd'A, Luther G, Yang R-Y, and Mecozzi, M
AVRDC – THE WORLD VEGETABLE CENTER, PO BOX 42, SHANHUA, TAINAN 74199, TAIWAN
usha.palaniswamy@worldveg.org

ABSTRACT

AVRDC – The World Vegetable Center's 'Vegetables Go to School' project focuses on promoting school gardens and increasing children's consumption of fresh vegetables in Bhutan and Nepal in South Asia, Indonesia and the Philippines in Southeast Asia, and Burkina Faso and Tanzania in Africa. The project, conducted in collaboration with the Swiss Tropical and Public Health Institute and the University of Freiburg, Germany, is funded by the Swiss Agency for Development and Cooperation. Country managers and project collaborators were invited from the agriculture/horticulture, education, and health sectors of the participating countries to attend a four-week long training of trainers workshop to identify the current status of school gardens and ascertain specific needs in promoting food and nutrition security through school garden-based approaches. The workshop focused on criteria for the selection of schools, sampling procedures, garden design, crop selection, planting schedules and good agricultural/horticultural practices, data collection and management strategies. The participants engaged in hands-on activities at the Center's demonstration garden and research facilities. Action plans created by the respective country teams at the end of the workshop included objectives, garden design layout, implementation, promotion, management, expected outcomes and nutritional impact assessment strategies. Following the training workshop, a three-day policy workshop brought together country policy makers, management and project advisory committees to evaluate the action plans and chart a course forward for implementing school gardens and obtaining data for impact assessment.

Healthy diets for better nutrition

Bayasgalanbat N
FAO REGIONAL OFFICE FOR ASIA AND THE PACIFIC, BANGKOK THAILAND
nomindelger.bayasgalanbat@fao.org

ABSTRACT

The paper highlights the importance of healthy diets for good nutrition and well being. It describes the emerging problems of double burden of malnutrition with rapid increase of non-communicable and diet related diseases that are affecting many countries in Asia and the Pacific region. Discussions are focused on great contributions that vegetables can make in combating this problem. It will present different approaches starting from selecting the varieties of vegetables of higher nutrient value, adequate way of cultivation and harvesting to maintain its nutrient quality, and the proper methods of processing and preservation for vegetables for enhancing nutrients. The crucial role of nutrition education and its greater impact will be debated. The importance of introducing innovative culinary recipes using different vegetables for conserving their nutritional properties, but at the same time meeting the taste, appearance and cultural acceptance. The paper will offer different options based on case studies and latest research.

Selection of cassava (*Manihot esculenta* Crantz) accession and processing of leaf for use as a protein rich vegetable in Bangladesh

Fakir M.S.A
DEPARTMENT OF CROP BOTANY BANGLADESH AGRICULTURAL UNIVERSITY (BAU), MYMENSINGH, BANGLADESH
fakirmsa@gmail.com

Rahim M.A
DEPARTMENT OF HORTICULTURE, BANGLADESH AGRICULTURAL UNIVERSITY (BAU), MYMENSINGH, BANGLADESH
marahim1956@yahoo.com

Mostafa G and Seal H
DEPARTMENT OF AGRICULTURAL CHEMISTRY, BANGLADESH AGRICULTURAL UNIVERSITY (BAU), MYMENSINGH, BANGLADESH

ABSTRACT

Protein intake in Bangladesh is much lower (49 g/person/day) than India (84 g/person/day), Australia (106 g/person/day) and USA (114 g/person/day). Cassava (*Manihot esculenta* Crantz) leaves are rich in protein and could be a potential source of protein nutrition in developing countries. Cassava accessions were screened based on the dry matter (DM) and hydrogen cyanide (HCN) contents, and nutritional composition in leaf for vegetable purposes. Eleven cassava accessions (Coc-A1, Kha-A2, Cow-A3, Sag-A4, Meg-A5, Var-A6, Org-A7, Syl-A8, IndA9, Mala-A10 and Viet-A11) were grown in the field following standard protocol. Leaves were harvested and their DM, HCN and proximate compositions were determined. Genetic variation for DM, HCN and proximate composition of leaf existed. In leaf, range of DM content varied from 1.89-7.19 t ha-1, HCN from 150.9-257.5 mg HCN kg-1 fresh wt, crude protein 18.36-25.44 % (dry wt. basis). Results further revealed that three accessions (Coc-A1, Kha-A2 and Syl-A8) possessed higher DM (av 6.43 t ha-1), lower HCN (av 190.97 mg HCN kg-1 fresh wt) and better crude protein content (av 23.11%). HCN of the fresh leaf of the selected accessions is not at all consumable (safe level: <50 mg HCN kg-1 fresh wt). For human consumption, safe level is <50 mg HCN 50 kg-1 body wt. Hence, the fresh leaves were further processed to remove HCN. The processing techniques employed were chopping, sun drying, boiling. Our results suggested that chopping followed by boiling (1000C for 30 min) removed 99% of the HCN, hence could safely be used for human consumption. It was concluded that selection of cassava accession with high DM, low HCN and good protein in leaf appeared potential. Processed leaf seemed safe for human consumption.

Key words:
Manihot esculenta, leaf, processing, vegetable, protein

Moringa an indigenous high value vegetable crop can play a great role in nutrition and poverty alleviation in Bangladesh

Rahim M.A , Anwar M.M and Alam M.S
DEPARTMENT OF HORTICULTURE, BANGLADESH AGRICULTURAL UNIVERSITY (BAU), MYMENSINGH, BANGLADESH
marahim1956@yahoo.com

ABSTRACT

Moringa *(Moringa* spp) is one of the world's most beneficial trees. This fast growing plant is grown throughout the tropics for human food, medicine, livestock forage, dye and water purification. It can easily be grown in the homestead and along the roadsides. The climate of Bangladesh fits pretty well for growing Moringa. The leaves and fruits of moringa contain high amount of beta-carotene, protein, vitamin C and iron. Both Moringa species. *M. oleifera* (locally known as Sajna- fruiting in one season) and *Moringa stenopetala* (locally known as Lajna- fruiting round the year) are most widely cultivated in Bangladesh. Malnutrition is a serious public health problem in the hunger prone northwestern region of Bangladesh. Moringa are playing a vital role to meet nutritional deficiency as well as to help to alleviate poverty mainly in the north-western region of Bangladesh. Research findings showed that *Moringa oleifera* and *Moringa stenopetala* both are well adapted to our northwestern region but in the southern saline and eastern wet areas grown well only the *M. oleifera*. Compared to summer vegetables like cucurbits, amaranths etc Moringa getting higher price. In the northern part of Bangladesh about 20% populations are depending on Moringa but in saline and hilly areas only 2.5%. Moreover, Moringa is utilizing largely against small pox, chicken pox as suggested by the physician.

Session 5: Enabling policies

26 February 2014 (Wednesday)

Rural Bio-Resource Complex Project, a model integrated agricultural development leads to economic growth

Narayanaswamy K.C. and Gowda N.K.
UNIVERSITY OF AGRICULTURAL SCIENCES, GKVK, BANGALORE, INDIA
vc@uasbangalore.edu.in

ABSTRACT

The focal mandate of 'Rural Bio-Resource Complex' (RBRC) project implemented by the University of Agricultural Sciences, Bangalore, India from April 2005 to March 2010 covering 8340 rural households in Bangalore Rural District of Karnataka was to enhance income and living standards of rural people particularly the small and marginal farmers. Initially five-pronged strategy was adopted, namely promotion of 20 capsules of profitable and appropriate technologies; provision of effective information support system; provision of quality critical inputs at the easy reach of the farmers including providing farm machinery on hire services; ensuring effective functional linkages and arranging forward market linkages. Subsequently, commodity-based associations were established based on the need for organized market to facilitate large number of small and marginal farmers to ensure profitable price for the produce.

In a span of five years, the project activities were able to bring about significant impact in terms of shift in cropping pattern, added net income, employment generation and improved socio-economic status of the stakeholders. The stakeholders were able to realize threefold increase in income, 11 percent annual growth rate in agriculture, 2.52 lakh additional employment generation annually and improvement in livelihoods besides retaining majority of youth. Integrated Farming System (IFS) validated in this project is being replicated in all the districts of Karnataka state covering 1.25 lakh families. The model evolved holds a promise for sustaining the livelihood system through increased employment opportunities.

One of the main interventions of RBRC activities was the promotion of improved varieties of vegetable crops to replace less profitable field crops. To facilitate growers to realize better prices, a Fruits and Vegetable Growers' Association was established at a strategic place to strengthen forward market linkages. The project provided skills to these growers that helped them in production and marketing and also improved the leadership qualities. Besides substantially improving the productivity and production of vegetables, role of middleman was minimized and overhead costs were reduced. The intervention was able to improve livelihoods of small and marginal farmers enhancing their competitiveness and higher share of the consumer payment by producers by around 60%. The RBRC model continues to evolve since its inception and remains to be self-sustained and driven by the effective participation of stakeholders. This diversifies agricultural entrepreneurship to generate employment and retain rural youth to practice agriculture.

Keywords

Rural Bio-Resource Complex (RBRC), agricultural development, Integrated Farming System (IFS), commodity based associations, socio-economic profile

Good agricultural practices for sustainable vegetable production in humid tropics

Nirmala D.S and Kumar S.P.G
AICRP (VEGETABLE CROPS), COLLEGE OF HORTICULTURE, KERALA AGRICULTURAL UNIVERSITY, INDIA
drsnirmala@yahoo.com

ABSTRACT

Good Agricultural Practices (GAPs) depend on enhancement and sustainability of natural resources and maintenance of viable farming enterprises that contribute to sustainable livelihoods. Adoption of suitable cropping pattern, cultural practices that maintain soil structure and application of adequate doses of manures and fertilizers to restore soil organic matter are some of the GAPs related to vegetable production. In India, cropping system is usually based on cereal or vegetable crops. Balanced dose of NPK, organic sources of nutrients and biofertilisers has proved superior with respect to yield, quality and nutrient uptake in vegetable crops.

In the humid tropics of Kerala, the important vegetable crops grown are cucurbits, solanaceous vegetables, leguminous vegetables, okra and amaranthus. Experiments were conducted on vegetable based cropping systems and good agricultural practices for vegetable production at All India Coordinated Research Project (Vegetable Crops), College of Horticulture, Kerala Agricultural University, located at 10^{0} 31′N latitude and 76^{0} 13′E longitude. During growing seasons from April-August, September-December and January-April, the vegetable based cropping system studies were compared with farmer's practices. The cropping sequences cowpea-tomato-bittergourd, okra-pumpkinbrinjal and ashgourd-bittergourd-bottle gourd were found remunerative giving higher net returns.

Integration of organic amendments and biofertilisers reduce the requirement for NPK and improve soil health and plant nutrient availability resulting in enhanced yields. Results of IPNM studies on the cropping sequence okra-tomato-cowpea revealed that application of FYM@20t/ha in okra and FYM@20t/ha along with AMF, *Pseudomonas*, *Trichoderma* and *Azotobacter*, each@5kg/ha in tomato gave significantly higher yields. Residual nutrients from the treatment FYM 20t/ha along with AMF, *Pseudomonas*, *Trichoderma* and *Azotobacter* each@5kg/ha gave highest yield in cowpea where no fertilizers/manures/biofertilizers/were added. Application of NPK @110:35:70kg/ha along with vermiwash soil application@1 l/bed and 3 foliar sprays @1l in10 l water at one week interval starting 30 days after sowing gave significantly higher yield of 12.3t/ha in okra. In cowpea FYM@20t/ha and in cucumber FYM@10t/ha along with vermicompost @2t/ha resulted in higher yields of 10.3t/ha and 23.5t/ha respectively In amaranth variety Arun application of 20t/ha FYM resulted in significantly higher yield of 16.7t/ha.

Use of inorganic fertilizers in conjunction with organic manures and biofertilisers is essential for sustainable and profitable vegetable production

Vegetable consumption at household level and its implication on vegetable farming development in Indonesia

Saliem H.P. and Ariningsih E
INDONESIAN CENTER FOR AGRICULTURAL SOCIO ECONOMIC AND POLICY STUDIES, BOGOR, INDONESIA
ening.ariningsih@yahoo.com

ABSTRACT

In spite of the importance of consuming adequate vegetables for health, nationally representative data on vegetables shows that vegetable consumption in Indonesia is still low and during the period 2007-2011 tends to decline. Data show that in 2011 vegetable consumption was only around 40.6 kg per capita a year; much lower than WHO/FAO recommendation, i.e. 73 kg per capita a year. On the other hand, during the same period vegetable production shows positive growth. As a result, in 2011 per capita vegetable production is higher than per capita vegetable consumption. However, for some vegetables such as spinach, water spinach, string bean, cucumber, and garlic, per capita production are lower than their per capita consumption. Until recently, Indonesia is still a net importer for vegetables, especially garlic, shallot, and onion. In spite of some problems and constraints it faces, Indonesia has big potential and good prospect to develop vegetable agribusiness. Some strategies in vegetable development implemented in Indonesia should be directed to efforts to develop production in accordance with needs, increase competitiveness, increase human resource capability and job opportunity, strengthen farmer institutional, capital and marketing, as well as optimize sustainable land use and infrastructure support.

Women's home gardens and food security: Evidence from Bangladesh

Schreinemachers P , Yang R and Hanson P
AVRDC – THE WORLD VEGETABLE CENTER, PO BOX 42, SHANHUA, TAINAN 74199, TAIWAN
pepijn.schreinemachers@worldveg.org

Patalagsa M.A and Takagi C
COLLEGE OF AGRICULTURE AND NATURAL RESOURCES, NATIONAL CHUNG HSING UNIVERSITY, TAICHUNG, TAIWAN

Islam M.R , Ahmad S and Begum S
USAID HORTICULTURE PROJECT, CIP/AVRDC BANGLADESH, BANANI, DHAKA, BANGLADESH

Uddin M.N
GRAMEEN BIKASH FOUNDATION, SOUTH MALTINAGOR, BOGRA, BANGLADESH

Biswas S.C
BRAC AGRICULTURAL RESEARCH & DEVELOPMENT CENTRE (BARDC), JOGITALA, BRRI, JOYDEBPUR, GAZIPUR, BANGLADESH

Ahmed T
BRAC AGRICULTURE AND FOOD SECURITY PROGRAM, DHAKA, BANGLADESH

ABSTRACT

Vegetable production in home gardens by poor rural women has the potential to immediately contribute to food and nutrition security by making a diverse range of vegetables available and accessible to those preparing food in the household. Although the basic concept of home gardens is compelling and improved home gardens have been promoted for decades, scientific evidence for impact is lacking. This paper aims to fill the gap by testing the hypothesis that home gardens improve household food security.

We used data from a structured questionnaire survey of 582 poor rural women in four districts of Bangladesh (Jessore and Barisal) collected in April-May 2013. Of these, 103 received training in improved gardening methods and the others were used as a control. Some women in the control group received training after the survey. A follow-up survey is planned for 2014. A comparison between households that did and did not receive training suggests that those who received training doubled the size of their gardens ($p<0.01$), produced a wider diversity of vegetables ($p<0.01$), and obtained produce for a greater period of time ($p<0.01$). However, the total weight of produce from the home gardens was lower ($p<0.01$), as the trained women grew more leafy vegetables instead of heavier pumpkins and gourds. Trained home gardeners also encountered a larger number of problems than untrained home gardeners ($p<0.01$) including produce theft, animal damage, and access to quality seed. Home gardens generated little cash, which was mostly received by men.

These preliminary results suggest a positive effect of home gardens on various indicators of food security, including access to diverse and nutritious food. However, the effect is not straightforward. Further analysis will focus on nutritional yields and food consumption.

Enhancing competitiveness of smallholder vegetable producers in the Southern Philippines: The role of local government

Hualda L A.
SCHOOL OF MANAGEMENT, CURTIN UNIVERSITY, PERTH, WESTERN AUSTRALIA, AUSTRALIA
luis.hualda@postgrad.curtin.edu.au

ABSTRACT

Smallholder producers are at the centre of international and national development initiatives because of their recognized importance in attaining poverty alleviation, promoting rural development and ensuring food security. Changes in consumer preferences and market structures caused by globalization, urbanization, population growth and rising income introduced challenges and constraints for smallholder producers to meet market requirements. Overcoming these challenges has been the focus of development organizations worldwide and it is through their assistance that smallholder producers are able to cope with challenges and constraints. However, the role of local governments has not been emphasized even though these are institutions that can introduce changes to the situation of smallholder producers. This paper investigated, through a series of key informant interviews and a survey of smallholder vegetable producers, the contributions of a supportive local government on the perceived competitiveness of smallholder vegetable producers in southern Philippines. Results showed that local government units can implement policies, such as allowing the use of idle lands, providing infrastructure and ensuring delivery of extension services, to support the efforts of smallholder producers. This shows that changes in institutional processes can be introduced making support to smallholder producers more sustainable.

Thai consumer valuation of food safety labels on fresh products

Wongprawmas R and Canavari M
DEPARTMENT OF AGRICULTURAL SCIENCES - DIVISION AGRICULTURAL ECONOMICS AND APPRAISAL, ALMA MATER ST UDIORUM-UNIVERSITY OF BOLOGNA, ITALY
rungsaran.wongprawmas80@gmail.com
Waisarayutt C
DEPARTMENT OF AGRO-INDUSTRIAL TECHNOLOGY KASETSART UNIVERSITY, BANGKOK , THAILAND
fagicmw@ku.ac.th

ABSTRACT

Food Safety has been concerned as a prominent issue in Thailand for a decade. Food Safety labels (e.g., Q mark from the Ministry of Agriculture and Cooperative) have been introduced to the market in order to assist consumers to recognize safe products, particularly fresh produce that is the main concern of Thai consumers. However, there is no clear evidence on the value Thai consumers place on the labels and this is reflected in the reluctance of the fresh produce industry and particularly producers to comply with regulations to obtain certification and label. This contributes to hinder the development of a market for safe fresh produce. It could also be a key constraint for the Thai government in its effort to present Thailand as "Thai Cuisine to the World" and for the industry to compete in the ASEAN Economic Community in 2015. This study is aimed at estimating the value Thai consumers place on food safety labels for fresh produce using a discrete choice experiment. The primary data has been collected through a survey aimed at eliciting consumers preferences and willingness to pay (WTP) for Chinese cabbage, trading off between different types of food safety labels and private brands, price, and freshness. A sample of 350 Thai consumers took part in the survey administered at different locations in Bangkok and vicinity in July 2013. Multinomial Logistic Regression (MNL) was used to analyze the data. Results suggest that consumers value quality labels (i.e., Q mark, Royal Project brand plus Q mark, and Doctor's Vegetable plus Q mark). Freshness, brand and label, and price are all considered as relevant attributes by consumers. We conclude discussing the implications of our findings for businesses and policy makers.

Growing forward: The potential of horticulture in the agriculture, rural and food policy adjustments of ASEAN Economic Community (AEC) member states

O'Reilly P
CROPS FOR THE FUTURE RESEARCH CENTRE, LEVEL 2 BLOCK B, THE UNIVERSITY OF NOTTINGHAM MALAYSIA CAMPUS , JALAN BROGA, SEMENYIH, SELANGOR, MALAYSIA
patrick.oreilly@cffresearch.org

Kassim A.I.
MALAYSIA CAMPUS, JALAN BROGA, SEMENYIH, SELANGOR, MALAYSIA

ABSTRACT

AEC, Agriculture, ASEAN, ASEAN Economic Community, Food Security, Regional Integration, Rural Development.

Due to come into effect in 2015, The Association of South East Asia Nations' (ASEAN) ASEAN Economic Community (AEC) is an attempt to create a strong integrated regional economic bloc. Yet, the accelerated deadline, ambitious milestones and obstacles in the way of its achievement have generated significant criticisms of the manner in which the AEC is being formed and raised questions as to its likely impact on different sectors of the ASEAN economy. In relation to agriculture, the historical experience of other trading blocs suggests that moves towards economic integration and the reduction of internal trade barriers simultaneously pose serious challenges and create significant opportunities for the sector. Successfully responding to this situation will require significant adjustments in agricultural, rural and food policy. With its capacity to produce diverse high value products, horticulture may have an important role to play in these adjustments offering options for high value diversification to the regions farmers.

Employing existing academic and policy literature this paper assesses the likely impact of the A.E.C on the regions agriculture, outlining the challenges and opportunities that the introduction of the A.E.C poses. The paper then reviews current debates concerning the implications of the introduction of the A.E.C on a wide range of polices which relate to agriculture, food and rural development in the region. The paper then identifies additional policy adjustments which may support agriculture in the region in adapting to the social and economic changes introduced by the A.E.C thereby contributing to the organization's successful implementation. Elements of these adjustments should include efforts to support the diversification of the agricultural landscape and output, a move towards self-reliance rather than self-sufficiency and cross-border initiatives. The paper concludes by outlining how the development of high value horticulture in the region can contribute to the successful implementation of such adjustments.

Vegetable research and development in Central Luzon Philippines

Dela Cruz Q.D
CENTRAL LUZON STATE UNIVERSITY, SCIENCE CITY OF MUNOZ, NUEVA ECIJA, PHILIPPINES
quirinodelacruz@yahoo.com
Aganon T.M
EXTENSION, AND TRAINING, CENTRAL LUZON STATE UNIVERSITY, SCIENCE CITY OF MUÑOZ, NUEVA ECIJA, PHILIPPINES

ABSTRACT

Vegetable is a large and diverse commodity in the Philippines. Cultivation are distributed to different ecosystems from the northern-southern part of the country. The country's goal is to cater the local and a portion of international demand. Majority of the vegetables are grown in the lowland although consistent supply come from the highland. There are factors affecting the supply chain that hinders the industry's growth particularly climate variabilities. Furthermore, farm inputs are very prohibitive.

The negative effect of limiting factors in vegetable production necessitates the conduct of research and development to cater the needs. The Department of Agriculture-Bureau of Agricultural Research (DA-BAR), Department of Science and Technology (DOST) and the Philippine Council for Agriculture Aquatic Resources Research and Development (PCAARRD) formulate research and development agenda and provide funds for national and regional thrust. Moreover, private companies are very active in vegetable research. Research and development are focused to solve problems on food security and poverty reduction as well as sustainable development integrating climate change concerns. Current researches are breeding resilient varieties, seed multiplication and distribution, organic vegetable production system (indigenous and new cultivars), protected cultivation and socioeconomic and development communication.

Closing Session (Plenary)

26 February 2014 (Wednesday)

The Global Horticulture Initiative – Challenges and Prospects for Southeast Asia

Virchow D
EXECUTIVE SECRETARY, GLOBAL HORTICULTURE INITIATIVE (GLOBALHORT), BONN, GERMANY
dvirchow@globalhort.org

ABSTRACT

Since more than a decade, the overall number of micronutrient-deficient and overnourished people has been increasing year-on-year. This trend will continue, despite the significant reduction in undernourishment in most countries of Southeast Asia. Horticulture will play a pivotal role in any approach to fight the threats of both, micronutrient deficiency and overnourishment. Besides the crucial role for nutrition and health, horticulture can foster economic development by raising incomes of smallholder farmers, increasing employment and opening new market opportunities. Landless people also can benefit from an emerging and growing horticultural sector through own production and opportunities in other parts of the value chain, such as processing and trading. Hence, horticultural activities pave the way for the integration of subsistence farmers, the landless and other resource-poor people once excluded from markets into broader economic activities, and thus play a significant role in sustaining rural communities. Women in particular are empowered by a vibrant horticultural sector, as they move from being dependent day labor and become self-employed entrepreneurs. In addition, poor households in urban areas benefit through improved access to fruit and vegetables and an increase in employment opportunities in the horticultural sector.

GlobalHort as an international consortium advocates and promotes innovation in horticulture for development with a multi-sector, multiple-actor approach to collaboration in research, capacity development, and technology-generating activities. The increased production, processing, marketing, and consumption of fruits and vegetables and other horticultural crops will lead to the improvement of human health and wellbeing as well as the creation of employment and wealth in Southeast Asia and will benefit in particular smallholder farmers and poor households. Besides advocating and promoting horticulture for development, GlobalHort's core activities are networking, attracting funding and coaching funded research projects as well as facilitating capacity development, education and training to support smallholders investing in horticultural enterprise.

The Indian Vegetable Research Programme and its Application in Asia

Krishna Kumar N.K.
DEPUTY DIRECTOR GENERAL (HORTICULTURE), INDIAN COUNCIL OF AGRICULTURAL RESEARCH,NEW DELHI, INDIA
ddghort@gmail.com

ABSTRACT

South Asia housing nearly one fifth of population with meager land, water and capital is demographically young. Food and nutritional security especially vitamin A, iron, thiamine and riboflavin are lacking amongst the poorest of the poor especially in women and children. India recently passed the Food Security Bill the implications and repercussions of which are yet to be felt. India produced ~260 million tons of food grains and ~157 million tons of vegetables in 2013. Paradoxically post-harvest loss in vegetables and fruits is still at 30 to 40 %.

One ray of hope for the small and marginal farmer is diversification of agriculture by shifting to vegetable cultivation. Being tropical and sub-tropical, the region is blessed with enormous diversity that enables intensive cultivation of vegetables all through the year. The introduction of high yielding varieties and hybrids, incorporation of pests and disease resistance, small scale value addition and processing have revolutionized the vegetable scenario in southern peninsula and central India. The benefits of technology such as protected cultivation, scientific water and nutrient management, PHT and value addition have been harnessed by only a significant minority. Exploitation of male sterility, double haploids, MAS, micronutrients, protected cultivation, hydroponics, aeroponics, vertical farming, supply chain management, quality assurance and enhanced use of biopesticides, organic cultivation should be the future thrust of research and development. A number of underutilized vegetables are waiting to be discovered, e.g., leafy vegetables, roots and tubers, minor cucurbits and legumes. Recent upsurge in the incidence of late blight, tospoviruses, whitefly transmitted begomoviruses, red spider mites, thrips and abiotic and biotic stresses need to be focused through research and development.

A scientific planning with focused research on minimizing PHL with PPP, clear policy guide line on GMO to is needed. Food and nutritional security in South Asia is a matter of basic need to nearly quarter of the human civilization. Science, technology and technology led development with commercialization can realize this dream.

Scaling up technologies for small scale vegetable farming systems in Southeast Asia

Jahn G
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID), BUREAU FOR FOOD SECURITY, OFFICE OF AGRI CULTURAL RESEARCH AND POLICY, WASHINGTON D.C.
ddghort@gmail.com

ABSTRACT

President Obama's global food security initiative, known as "Feed the Future" works with partner countries to develop their agriculture sectors and break the vicious cycle of poverty, hunger, and malnutrition. The United States Agency for International Development (USAID) Office of Agricultural Research and Policy supports Feed the Future through its portfolio to develop and scale up technical innovations to boost the productivity of smallholder farmers, who are the key to unlocking agricultural growth, improving nutrition, and transforming economies. An estimated 80% of the farmland in sub-Saharan Africa and Asia is managed by smallholders (working on up to 10 hectares). Over 70% of the world's malnourished children live in Asia. About 11% of Southeast Asia's population, i.e. about 67 million people, suffer from undernourishment. Most of these dietary deficiencies can be addressed through increased consumption of a diversity of vegetables. Small scale vegetable farming offers the opportunity to reduce undernourishment, hunger, and poverty, while generating employment and income, especially for women. USAID supports research to advance small scale vegetable farming through several collaborative programs known as Innovation Labs. These include Innovation Labs for Climate Resilient crops, Integrated Pest Management (IPM), Nutrition, Sustainable Agriculture and Natural Resource Management (SANREM), Food Security Policy, and Horticulture. USAID projects leverage public and private sector resources to extend Innovation Lab technologies to smallholder farmers, and scale up through a value chain approach.

Poster Session

Effect of chitosan on off season tomato yield

Boonlertnirun K, Yimyam S and Boonlertnirun S
FACULTY OF AGRICULTURAL TECHNOLOGY AND AGRO-INDUSTRY, RAJAMANGALA UNIVERSITY OF TECHNOLOGY SUVARNNABHUMI, PHRANAKHON SI AYUTTHAYA PROVINCE, THAILAND
suchada.b@rmutsb.ac.th

ABSTRACT

Rainy season is unsuitable for cherry tomato production in central part of Thailand. High temperature and humidity caused the spread of disease resulted in less fruit set and yield loss. The objective of this study was to compare yield and yield components of cherry tomato produced in winter and rainy season after being applied with different chitosan concentrations. Randomized complete block design with five chitosan concentrations, 0 20, 40, 60, and 80 ppm, was performed and replicated four times. Cherry tomato seedlings var. Tony were transplanted into 15 -liters pot size and placed in an open –ended outdoor green house. One experimental unit per replication comprised ten pots. Chitosan spraying was firstly started from transplanting until harvesting every a week interval. The results indicated that different chitosan concentrations did not significantly affect yield and yield components of cherry tomato in both seasons. However, cherry tomato var. Tony had good adaptation in a greenhouse and tended to produce more yields in winter season than those in rainy season. Yield losses in rainy season were caused by less fruit set and fruit slip before harvesting time.

Effective microorganisms effects on yield and quality of Chinese cabbage

Olle M
ESTONIAN CROP RESEARCH INSTITUTE, J. AAMISSEPA 1, JOGEVA ALEVIK 48309, ESTONIA
margit.olle@gmail.com

ABSTRACT

The aim of the present study was to evaluate the influence of effective microorganisms (EM) on yield, storage and chemical contents (nitrates, calcium, vitamin C, dry matter, monosaccharide's and sugars) of Chinese cabbage. Two treatments were used: 1 – with activated EM (watered with 1:2000 activated EM solution 4 times during growing season), 2 – without EM (watered with pure water 4 times during growing season; it is control). The yield was not influenced by the treatment watered with EM. EM reduced the storage loss in Chinese cabbage (significance level: two weeks from storage p=0.035, four weeks from storage p=0.038). No significant difference in dry matter content was found in Chinese cabbage treated with EM. The vitamin C content in Chinese cabbage was higher in EM treatment after 28 days of storage (significance level p=0.032), but no differences occurred after harvest. The monosaccharides and sugars contents were not influenced by EM treatment. The contents of nitrates in Chinese cabbage were not significantly different with the use of EM. The calcium content in Chinese cabbage was higher in EM treatment after harvest (significance level p=0.029), but no differences occurred after storage. In conclusion, the yield of Chinese cabbage was not influenced by EM treatment. The storage loss was lower in EM treatment. Vitamin C content was higher in EM treatment 28 days after storage. The content of calcium was higher in EM treatment after harvest.

Fertilizer recommendations for sustainable production of some vegetables in the Mekong Delta of Vietnam

Tran, K. C.
SOUTHERN HORTICULTURAL RESEARCH INSTITUTE (SOFRI), TIEN GIANG, VIET NAM
tkcsofri@yahoo.com

ABSTRACT

Vegetable production area of Vietnam is about 780,000 ha, in which approximately 25% belong to the Mekong Delta. Much of the vegetables cultivated in Mekong Delta are grown in rotation with rice and some crops, so that it should require the care, fertilizer tougher to get productivity and economic efficiency. Using more pesticides and chemical fertilizers are two main factors that affect product safety and reduce economic efficiency of vegetable production in this region. The Southern Horticulture Research Institute carried out many experiments to determine the optimal(?) amount and usage of fertilizer on cucumber, melon, okra and cabbage. The experiments consisted of multiple doses of fertilizer from the reference, laid out using randomized complete block design, and compared to the actual production of farmers. Results of the experiments identified the following fertilizer formulas for recommendation: 220kg N + 180kg P_2O_5 + 150kg K_2O + 500 kg microbial organic fertilizer (MOF)/ha for cucumber; 150kg N + 150kg P_2O_5 + 150kg K_2O + 500 kg MOF/ha for bitter gourd; 250kg N + 120kg P_2O_5 + 100kg K_2O + 500kg MOF/ha for cabbage, and 70kg N + 50kg P_2O_5 + 50kg K2O + 500kg MOF/ha for okra. This study also determined the most suitable time to apply recommended amounts for each crop to avoid waste, increase economic efficiency for growers and product safety for consumers.

Seed development and maturation of winged bean (*Psophocarpus tetragonolobus* L.) DC.

Suvannasara R, Boonlertnirun S and Boonlertnirun K
FACULTY OF AGRICULTURAL TECHNOLOGY AND AGRO-INDUSTRY, RAJAMANGALA UNIVERSITY OF TECHNOLOGY SUVARNNABHUMI, PHRANAKHON SI AYUTTHAYA PROVINCE, THAILAND
suchada.b@rmutsb.ac.th

ABSTRACT

The objective of this experiment was to investigate seed development and maturity of winged bean (*Psophocarpus tetragonolobus* L.) DC. The experiment was conducted at Department of Plant Science, Rajamangala University of Technology Suvarnabhumi from December 2012 to April 2013. At flowering stage, the flowers were tagged to check the flowering date. Seeds of winged bean were harvested at various times including 3, 6, 9,12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48 and 51 days after flowering to investigate pod color and seed quality. The results showed that winged beans had three developmental stages of pod color: yellow green at 339 days, grey brown at 42 days and brown at 45-51 days after flowering. The winged beans could germinate at 27days after flowering with seed dry weight of 10.25 g / 50 seeds, moisture content of 57.15 % and the germination of 62%. The seeds reached physiological maturity at 36 days after flowering with maximum dry weight of 13.88 g / 50 seeds, moisture content of 54.54 % and germination of 64.00 %. The maximum seed germination was found during 39 to 45 days after flowering.

Traditional marketing system with wild and traditional vegetables growing in small-scale farming systems in North-eastern India

Das SC
COLLEGE OF AGRICULTURE, DEPARTMENT OF HORTICULTURE, LEMBUCHERRA, TRIPURA, INDIA
sukhenchandra@rediffmail.com

ABSTRACT

Wild and traditional vegetables are grown in huge quantities in the homestead, fallow, forest areas as well as in the road sides with minimal care and poor marketing systems. Agro-climatic conditions, fertile acidic soils with good depth and an abundance of rainfall favour the cultivation of various kinds of wild and traditional vegetables. Large numbers of wild vegetables grown in the state with more than 80 species have been identified. Interior peoples prefers traditional vegetables for their food, including bamboo shoot (*Bambusa s*p.), tender leaves of elephant foot yam (*Amorphophallus paeoniifolius*), colocasia or taro (*Colocasia esculentus*) and xanthosoma (*Xanthosoma sagittifolium*),Greater galangal (*Alpinia galangal*), Tit Begun (*Solanum indicum*), leafy vegetables like fern tender shoots (*Ceratopteris thalictroides*), lai (*Brassica juncea*), amaranth (*Amaranthus* spp), spiny amaranthus (*Amaranthus spinosus*), Pui (*Basella alba*), Punarnaba (*Boerhavia diffusa*), hiencha (*Enhydra fluctuans*), Lajalu (*Mimosa* sp.), sem (*Dolichos purpureus*), tree bean (*Parkia roxburghii*), jack bean (*Canavalia gladiata*), winged bean (*Psophocarpus tetragonalobus*), Kakrol (*Momordica cochinchinensis*), coccinia (*Coccinia indica*), parwal or pointed gourd (*Trichosanthus dioca*), chilli (*Capsicum* sp.) and *Dioscorea* sp. These wild and traditional vegetables are marketed by domestic producers as well as in local markets without proper prices such as at road sides, near rail stations and rail stops, bus stops etc. All these crops are easy to grow and hardy in nature, producing a crop even under adverse climatic conditions. Moreover, these crops are providing nutrition and livelihoods for rural and interior peoples in the state. This paper lays emphasis on exploiting the potential usefulness of such valuable resources by adopting systematic marketing systems in rural and interior areas.

Adaptation of some chili lines in upland areas of Bali, Indonesia

Aribawa I.B and Kariada I.K
BALI ASSESSMENT INSTITUTE FOR AGRICULTURAL TECHNOLOGY, DENPASAR, BALI, INDONESIA
k_kariada@yahoo.com

Mariyono J and Luther G.
AVRDC – THE WORLD VEGETABLE CENTER, PO BOX 42, SHANHUA, TAINAN 74199, TAIWAN

ABSTRACT

Chili is a high economic value, multipurpose crop. It is an important vegetable crop used as ingredient of medicines and kitchen spices. Bali is capable of producing large quantities of fresh chili, with production of 13,780 t during the 2012 harvest from about 1,500 ha. The average productivity is about12.03 t/ha. This is 4.59% lower than production of previous year due to decline in productivity and reduction in harvested area. Utilization of a single chili variety in every season causes a decrease in productivity and farmers have lack of alternatives in diversifying variety of chili. This study aims to assess some improved lines of chili through multi-location variety trial and determine the adaptability of each line to upland chili production areas. The study was implemented in the upland areas of Candikuning village, Baturiti district, Tabanan - Bali in the 2013 growing season using a randomized complete block design with five replications. Four lines of chili are considered as treatment. The study tests chili lines of AVPP-0708; AVPP-1102; AVPP-1344, which come from AVRDC – The World Vegetable Center, and Kencana as control. Agronomic variables measured in this study include plant height, number of branches, plant diameter, and number of fruits per plant, fruit length, fruit diameter, and average fruit weight, number of seeds per fruit, chili production per hectare and the taste of the chili. The results show significant differences on plant height, fruit length, number of seeds per fruit, fruit diameter and fruit weight. AVPP-1344 shows the heaviest fruit, which is 17.16 grams per fruit, which was significantly greater than the other lines tested and the check. In terms of plant height, the Kencana is the tallest. The improved chili lines can be used as alternative lines when price of chili is high because they can be harvested earlier than those usually grown by farmers.

Research application of organic and inorganic fertilizers on tomato production in dry upland areas with wet climate at Buahan Kaja village, Gianyar district, Bali, Indonesia

Kariada I.K
BALI ASSESSMENT INSTITUTE FOR AGRICULTURAL TECHNOLOGY, DENPASAR, BALI, INDONESIA
k_kariada@yahoo.com

ABSTRACT

Research on the application of organic and inorganic fertilizer was implemented in the farming system zone (FSZ) dry-upland area with wet climate at Buahan Kaja village subdistrict of Payangan, Gianyar district of Bali in the 2012 planting season. The purpose of this research was to investigate the effect of different fertilizers on tomato production. The experiments were a randomized block design (RBD) with 4 treatments and 6 replications i.e.: (a) P0: Farmers way - NPK 100-50-50; (b) P1: wet bio-urine fertilizer 250 l/ha (diluted 5 times) applied once every 10 days, (c) P2: casting organic fertilizer 5 t/ha, and (d) P3: biogas sludge fertilizer 5 t/ha. Parameters measured were: plant height, number fruit trusses per plant, number of fruit per truss, fruit diameter, fruit weight, and yield per hectare. Results showed that treatment P2 was significant different to other treatments in all parameters (except fruit diameter) analyzed. The highest yield was achieved by treatment P2 (casting organic fertilizer 5 t/ha) followed by P3 (application of biogas sludge, then P2 (application of bio urine) and the lowest from treatment P0 (farmers way by using chemical fertilizers). The use of casting organic fertilizer and biogas sludge as an organic fertilizer can be used to substitute for the intensive use of chemical fertilizers which is not environmental friendly. The use of organic fertilizers produced by farmers can be more efficient and profitable than the use of inorganic fertilizers.

List of Participants

A total of 96 participants from 20 countries have registered for the symposium at the time of printing the Book of Abstracts. This number does not include on-site registrations.

#	Name	Organization	Country	E-mail
1	Luis Antonio T. Hualda	Curtin University	Australia	luis.hualda@postgrad.curtin.edu.au
2	Natalie Banks	CSIRO Ecosystem Sciences	Australia	natalie.banks@csiro.au
3	Mike Hodda	CSIRO Ecosystem Sciences	Australia	mike.hodda@csiro.au
4	Lalita Bhattacharjee	Food and Agriculture Organization (FAO) of the United Nations	Bangladesh	lalita.bhattacharjee@fao.org
5	Md. Abdur Razzaque Akanda	Bangladesh Agricultural Research Institute, (BARI)	Bangladesh	razzaquebari@gmail.com
6	Mahbubur Rahman Khan	Bangladesh Agricultural Research Institute (BARI)	Bangladesh	mahbubur.bio@bari.gov.bd
7	M. A. Rahim	Bangladesh Agricultural University	Bangladesh	marahim1956@yahoo.com
8	MSA Fakir	Bangladesh Agricultural Research Institute (BARI)	Bangladesh	fakirmsa@gmail.com
9	Richard Rose	International Development Enterprises	Bangladesh	richard.rose@ide-bangladesh.org
10	Sujit K. Biswas	Bangladesh Agricultural Research Institute	Bangladesh	sujitbari@yahoo.com
11	Nancy J Haselow	Helen Keller International	Cambodia	nhaselow@hki.org
12	Annick Schubert	Annâdya	Cambodia	annick.schubert@gmail.com
13	Nun Channy		Cambodia	
14	Degbeu Claver Kouadio	University of Nangui Abrogoua	Côte d'Ivoire	kouadc@yahoo.fr
15	Axel W. Drescher	University of Freiburg	Germany	axel.drescher@geographie.uni-freiburg.de
16	Detlef Virchow	Global Horticulture Initiative	Germany	dvirchow@globalhort.org
17	Akhilesh Sharma	Himachal Pradesh Agricultural University	India	p.h.brown@cqu.edu.au
18	Bijendra Singh	Indian Institute of Vegetable Research	India	bsinghiivr@gmail.com
19	Bhuvaneswari G.	University of Horticultural Sciences	India	bvndwd@yahoo.co.in
20	K.C.Siva balan	Department of Agril Extension and Rural Sociology	India	shiv_balan@yahoo.com
21	H.P. Singh	Indian Council of Agricultural Research	India	hpsingh2008@gmail.com
22	N. Basavaraja	College of Horticulture	India	nbraja2010@gmail.com
23	O.P. Dutta	Namdhari Seeds Pvt. Co.Ltd.	India	opdutta@hotmail.com
24	Prem Nath	Dr. P.N. Agricultural Science Foundation (PNASF)	India	drpremnath@vsnl.net
25	P.G. Chengappa	University of Agricultural Sciences, Bangalore	India	chengappapg@gmail.com
26	S. Nirmala Devi	Kerala Agricultural University	India	s drsnirmala@yahoo.com
27	N.K. Krishna Kumar	Indian Council of	India	ddghort@gmail.com

		Agricultural Research		
28	K. C. Narayanaswamy	University of Agricultural Sciences	India	kcn_uas@yahoo.co.in
29	Evy Latifah	Agricultural Technology East Java	Indonesia	evy_latifah@yahoo.com
30	Handewi Purwati Saliem	Indonesian Center for Agriculture Socio Economic and Policy Studies	Indonesia	handewipurwati@gmail.com
31	Ida Bagus GDE Suryawan	Assessment Institute for Agricultural Technology	Indonesia	ibgsuryawan@hotmail.com
32	Ening Ariningsih	Adama Science and Technology University	Indonesia	ening.ariningsih@yahoo.com
33	Adimas Prasetyo	Bogor Agricultural University	Indonesia	adimas_prasetyo@yahoo.co.id
34	Arpah Saleng	Bogor Agricultural University	Indonesia	arpahsaleng@yahoo.com
35	Rungsaran Wongprawmas	University of Bologna	Italy	rungsaran.wongprawmas80@gmail.com
36	Tomohide Sugino	Japan International Research Center for Agricutural Sciences	Japan	tosugino@jircas.affrc.go.jp
37	Linkham Douangsavanh	National Agriculture and Forestry Research Institute (NAFRI)	Lao PDR	linkham_d@yahoo.com
38	Mohamad Roff Mohd Noor	Malaysian Agricultural Research and Development Institute	Malaysia	mohamad roff@mardi.gov.my
39	Aaron Thomas Myatt	Crops for the Future Research Centre	Malaysia	khby2ata@nottingham.edu.my
40	Patrick O'Reilly	Crops for the Future Research Centre	Malaysia	patrick.oreilly@cffresearch.org
41	Stuart Morris	East West Seed Group	Myanmar	stuart.morris@eastwestseed.com
42	Mike Nichols	Massey University	New Zealand	m.nichols@massey.ac.nz
43	Arturo O. Manipon	Research Extension and Training of the Central Luzon State University	Philippines	maniponarturo@yahoo.com
44	Lydia C Medina	IFUGAO STATE UNIVERSITY	Philippines	mayumi_1327@yahoo.com
45	Ma. Cecilia Cruz Gatbonton	Laguna State Polytechnic University	Philippines	mcgatbonton@yahoo.com
46	Ma Cresilda M. Caning	Central Bicol State University of Agriculture	Philippines	crescane@gmail.com
47	Rodel G. Maghirang	University of the Philippines Los Banos	Philippines	megrulla@gmail.com
48	Christian Genova II	ICF-GHK Consulting	Philippines	genova.christian@gmail.com
49	Gloria Y. Ponciano	Tarlac College of Agriculture, Romulo, Camiling, Philippines	Philippines	gyponciano@yahoo.com
50	Mary Ann Sayoc	East West Seed Group	Philippines	maryann.sayoc@eastwestseed.com
51	Fong Siew Lee	Agri-Food & Veterinary Authority of Singapore	Singapore	fong_siew_ee@ava.gov.sg
52	Gek Hoon Khoo	Agri-Food and Veterinary Authority (AVA)	Singapore	khoo_gek_hoon@ava.gov.sg
53	T. A. Dharmaratne	Hector Kobbekaduwa Agrarian Research and Training Institute	Sri Lanka	hubeiagriculture@yahoo.com
54	Andreas Ebert	AVRDC – The World Vegetable Center	Taiwan	andreas.ebert@worldveg.org
55	Pepijn Schreinemachers	AVRDC-The World Vegetable Center	Taiwan	pepijn.schreinemachers@worldveg.org
56	Peter Hanson	AVRDC - The World	Taiwan	Peter.hanson@worldveg.org

		Vegetable Center		
57	Shieh, Hsueh-ching	AVRDC-The World Vegetable Center	Taiwan	jin.shieh@worldveg.org
58	Srinivasan Ramasamy	AVRDC-The World Vegetable Center	Taiwan	srini.ramasamy@worldveg.org
59	Usha Palaniswamy	AVRDC-The World Vegetable Center	Taiwan	usha.palaniswamy@worldveg.org
60	Vasant M Ganiger	AVRDC-The World Vegetable Center	Taiwan	vasantg.veg@gmail.com
61	Jackie Hughes	AVRDC - The World Vegetable Center	Taiwan	jackie.hughes@worldveg.org
62	Shu-Ching Liang	AVRDC - The World Vegetable Center	Taiwan	teresa.liang@worldveg.org
63	Yin-fu Chang	AVRDC - The World Vegetable Center	Taiwan	yin-fu.chang@worldveg.org
64	Victor Afari-Sefa	AVRDC - The World Vegetable Center	Tanzania	victor.afari-sefa@worldveg.org
65	Narinder Dhillon	AVRDC-The World Vegetable Center	Thailand	narinder.dhillon@worldveg.org
66	Orathai Wongmetha	Chiang Mai Royal Agricultural Research Center, DOA	Thailand	agriculture_24@hotmail.com
67	Prabhat Kumar	Asian Instiute of Technology	Thailand	pkipm@ait.ac.th
68	Prem Mehta	East West Seed Group	Thailand	prem.mehta@eastwestseed.com
69	Ralph Houtman	Food and Agriculture Organization (FAO) of the United Nations	Thailand	ralph.houtman@fao.org
70	Ratchanee Siriyan	Sisaket Horticultural Research Center, DOA	Thailand	noy_siriyan@hotmail.com
71	Rosa Rolle	Food and Agriculture Organization (FAO) of the United Nations	Thailand	rosa.rolle@fao.org
72	Hiroyuki Konuma	FAO Regional Office for Asia and the Pacific	Thailand	Hiroyuki.Konuma@fao.org
73	Subash Dasgupta	FAO-Regional Office for Asia and the Pacific	Thailand	subash.Dasgupta@fao.org
74	Nomindelger Bayasgalanbat	FAO-Regional Office for Asia and the Pacific	Thailand	nomindelger.bayasgalanbat@fao.org
75	Joost Pekelharing	East West Seed group	Thailand	francine.sayoc@eastwestseed.com
76	Jintana Yhoung-Aree	Mahidol University	Thailand	jintana.yho@mahidol.ac.th
77	Robert de la Peña	East West Seed Group	Thailand	robert.delapena@eastwestseed.com
78	Grisana Linwattana	Horticulture Research Institute, Department of Agriculture	Thailand	linwattana@chaiyo.com
79	Narendra Singh	HM-Clause	Thailand	-
80	Simon Jan De Hoop	EastWest Seed Group	Thailand	-
81	Tom Burns	Asia & Pacific Seed Association	Thailand	-
82	Apinun Uppabunzuno	Rijk Zwaan Exportr B.V.	Thailand	a.uppabunlung@rijkzwaan.com
83	Axelle Stahl	Clause (Thailand) Co., Ltd.	Thailand	axelle.stahl@hmclause.com
84	Shah Md Monir Hossain	Kasetsart University	Thailand	monirsmh@yahoo.com
85	Kelly Lapkorekkasuk	The Border Consortium	Thailand	lek@theborderconsortium.org
86	Thanit Satitboon	The Border Consortium	Thailand	shawn@theborderconsortium.org
87	Robert Holmer	AVRDC - The World Vegetable Center	Thailand	robert.holmer@worldveg.org
88	Sheila de Lima	AVRDC - The World	Thailand	sheila.delima@worldveg.org

		Vegetable Center		
89	Sopana Yule	AVRDC-The World Vegetable Center	Thailand	Sopana.yule@worldveg.org
90	Supunsa Phethin	AVRDC-The World Vegetable Center	Thailand	Supunsa.phethin@worldveg.org
91	Ratchada Thongkrailad	AVRDC-The World Vegetable Center	Thailand	ratchada.thongkrailad@worldveg.org
92	Sorawit Limsiriwat	AVRDC-The World Vegetable Center	Thailand	sorawit.limsiriwat@worldveg.org
93	Atilla Ata	Cukurova University	Turkey	atillaata@hotmail.com
94	Lala A. Kumar	University of Missouri Extension	USA	kumarl@missouri.edu
95	Gary Jahn	US Agency for International Development (USAID)	USA	gjahn@usaid.gov
96	Nguyen Thi Ha	Vietnam Agriculture Academic of Sciences	Vietnam	hanguyenhua@gmail.com