

fresh



News from AVRDC – The World Vegetable Center

9 September, 2011

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AVRDC research team enjoys a fruitful study tour in eastern Taiwan

Page 3



Decades of IPM innovation recognized

AVRDC – The World Vegetable Center receives award for 40 years of multidisciplinary teamwork and partnerships that have helped farmers control plant insect pests and diseases across the globe.



(l to r): Marlene Diekmann, Jaw-Fen Wang, and Srinivasan Ramasamy accept the award from Geoff Norton, Associate Director, Centre for Biological Information Technology (CBIT), The University of Queensland, Australia at the International Plant Protection Congress in Honolulu, Hawaii.

The dedication, patience, and knowledge involved in developing improved vegetable lines and production methods for small-scale farmers were illuminated when **AVRDC – The World Vegetable Center** researchers received the Team Award of Distinction from the

International Association for the Plant Protection Sciences at the XVII International Plant Protection Congress in Honolulu, Hawaii, USA on August 7, 2011.

The award was presented to all of the Center's plant protection

specialists and breeders—past and present—and to the partners who have contributed to the success of the institution’s integrated pest management (IPM) strategies for tomato, pepper, and eggplant.

Plant Pathologist **Jaw-Fen Wang** and Entomologist **Srinivasan Ramasamy** accepted the award on behalf of their colleagues, including Tomato Breeder **Peter Hanson**, Pepper Breeder **Paul Gniffke**, and Virologist **Lawrence Kenyon**. **Marlene Diekmann**, a member of the AVRDC Board of Directors, also was present at the award ceremony.

“This award acknowledges the Center’s long tradition of applying science to improve livelihoods for poor farmers,” said Dyno Keatinge, AVRDC Director General. “It reflects the Center’s continuing commitment to agricultural progress in the developing world, and better health for all.”

Successful IPM strategies combine use of resistant varieties, cultural practices, monitoring, mechanical and biological controls, and responsible pesticide use for a more ecologically sound approach to agriculture.

IPM strategies that work

In South Asia, **eggplant** often is the only vegetable available at an affordable price for the rural and urban poor during the monsoon season. In Bangladesh and India, farmers sprayed insecticides up to 180 times during a 6-7 month growing season to control eggplant fruit and shoot borer (EFSB), a pest capable of destroying an entire crop. An AVRDC IPM strategy promoted in the two countries involved better field sanitation, prompt removal and destruction of

infested plant shoots and fruits throughout the season, the use of sex pheromone traps to attract and kill adult EFSB males, and withholding pesticides for as long as possible to allow the pest’s natural enemies to thrive. By following the IPM strategy, farmers were able to reduce pesticide use by 65-75%. In Bangladesh, farmers sprayed pesticides only 21-22 times per season compared with 90-110 times in non-IPM fields. The strategy has been adopted by many communities beyond the initial implementation locations, with a significant impact on food security.

Improvements through breeding

Insect- and disease-resistant vegetables bred by the Center’s researchers over the years have now become integral parts of IPM strategies in Africa and Asia.

More than 164 **tomato** varieties based on the Center’s improved breeding lines have been released in 39 countries to help farmers deal with the three most challenging problems of tomato production in the tropics: geminiviruses transmitted by whitefly, which cause tomato yellow leaf curl disease (TYLCD), bacterial wilt, and late blight. In East Africa, AVRDC improved varieties increased tomato production by almost 40%, reduced production costs by 17%, and increased farm income by 21%. In India, tomato varieties resistant



(l to r): Paul Gniffke, Srinivasan Ramasamy, Lawrence Kenyon, Peter Hanson, and Jaw-Fen Wang.

to bacterial wilt and TYLCD produce 87% higher yields and receive 90% better market prices than nonresistant varieties.

Peppers are popular throughout Asia, but both chili and sweet pepper suffer from many diseases and are difficult to grow in hot, humid conditions. The Center has released 99 chili pepper and 39 sweet pepper lines with improved resistance to anthracnose, bacterial wilt, *Phytophthora* blight, and viruses. A survey of 29 Asian seed companies showed that 16% of the chili pepper cultivars they will release in the near future were developed from AVRDC improved breeding lines.

Production technologies

Grafting is a useful method to counter soil-borne diseases and waterlogged soils. The Center’s grafting technology, in which tomato and pepper scions are grafted onto disease resistant, flood-tolerant rootstocks, allows farmers to produce high value vegetables during the off-season. In Vietnam, grafted tomatoes yielded 60 tons per hectare in Lam Dong—an increase of 50% in yield compared with non-grafted tomatoes.

Home-grown knowledge



(Top): Mr. Chin-fen Chen (r), Horticultural Project Leader of Taitung District Agricultural Research and Extension Stations (DARES) briefs the AVRDC study tour group. (Right): Tsai-kuei Lin, Senior Field Assistant, Indigenous Vegetables from AVRDC-The World Vegetable Center holds a fragrant *Dianthus chinensis*, one of the heat-tolerant ornamental flowers bred by Taitung DARES.

Sometimes the best learning takes place close to home. A group of 19 AVRDC **assistant specialists, research assistants, field staff and technicians** embarked on a three-day study tour of agricultural centers in eastern Taiwan from 23-25 August 2011. It was the first of two study tours organized by **Global Technology Dissemination and Human Resources** to facilitate knowledge and technology exchange with other research institutions and build capacity of local staff.

Led by **Susan Lin**, Principal Research Assistant in Pepper Breeding, the group visited the Taitung and Hualien District Agricultural Research and Extension Stations (DARES), Fuli Farmers' Association, Taitung Indigenous and Medicinal Botanical Garden (Taitung Yuan-

Shen Botanical Garden), daylily plantations, a Chinese yam (*Dioscorea opposita*) production area, and the Ji-an aboriginal vegetables market.

Experts from each center introduced the AVRDC visitors to their most recent research, technologies, and agricultural products. The AVRDC staff asked plenty of questions about various uses for ferns, preserving color in daylilies, breeding bitter melon, chili pepper, tomato and indigenous crops, and new production methods for Chinese yam. Their questions reflected the dedication and professionalism each staff member brings to their area of research or work.

Interaction with the staff at the Taiwan institutions allowed for the exchange of valuable lessons learned in the lab and field,

including new ways to research vegetables—progress that is likely to continue as new partnerships forged during the trip flourish.

The participants evaluated each day's learning experience as a group, sharing their insights and ideas as the tour bus carried them across the fields of eastern Taiwan. The hours on the road brought colleagues closer together as they discussed their disciplines and learned how the research of others is related to and informs their own.

A study tour to central Taiwan agricultural centers will be held September 6-8.

-- Jen Wen Luoh

World Vegetable Center strengthens ties with WorldFish Center



Participants at the WorldFish Science Week in Penang, Malaysia.

East and Southeast Asia Regional Director **Robert Holmer** attended the **WorldFish Center's Science Week** from 18 – 22 July at their headquarters in Penang, Malaysia. WorldFish is leading the project "Harnessing the Development Potential of **Aquatic Agricultural Systems (AAS)** for the Poor and Vulnerable," which was recently approved by the Consultative Group on International Agricultural Research (CGIAR) Fund Council.

To avoid a narrow commodity focus, WorldFish aims to link with international partners such as AVRDC to pursue the most sensible and productive combination of crops, fish, livestock, fruits,

vegetables, and non-farm activities.

The target countries are within the geographic coverage of all AVRDC regional offices: Egypt (Central & West Asia and North Africa), Zambia (Africa), Bangladesh (South Asia), Cambodia, Philippines (East and Southeast Asia) as well as the Solomon Islands (Oceania).

Robert joined a series of workshops designed to acquaint the Center's staff and partners with WorldFish's strategy and the two CGIAR research programs (1.3 and 3.7) it is involved in. Participants discussed topics in five areas: research and development, gender, partnerships, monitoring and evaluation/impact assessment, and value chains.

At the end of each day, participants gave brief talks on their recent research in a Science Forum.

Robert's presentation, "A Recipe for Healthy Cities: Vegetable Production in the Urban Environment," led to further discussion of collaboration and project opportunities. Robert sees many similarities between WorldFish and AVRDC. Both are relatively small centers, and one of their distinctive features is a focus on nutritional security.

Greg Luther, AVRDC Technology Dissemination Specialist, will visit WorldFish South Asia in Bangladesh in September to give recommendations on suitable vegetable cultivars and corresponding production practices. His advice will support the household nutrition and horticulture component in the Cereal Systems Initiative for South Asia (CSISA), another WorldFish program.

Where fish, water and vegetables meet



Dhap vegetable cultivation in Bangladesh is carried out on a floating layer of water hyacinth, straw, or rice stubble. The floating raft is strengthened with bamboo, and bamboo poles fix the raft in position to avoid damage caused by wave action or drifting. The floating raft can then be transferred to any submerged location for agricultural purposes. The main crops cultivated in floating gardens include okra, cucumber, bitter melon, kohlrabi, tomato, turmeric, and potato.

(Top): In *Dhap* systems, fish feed on the organic matter that collects under the floating rafts.

(Center): Floating gardens, promoted by the NGO Osmose in the village of Prek Toal in Tonle Sap, Cambodia (Photo by Edward Hugh Allison, *World Fish*)

(Bottom): Floating vegetable containers in the pier area of Krabi, Southern Thailand (Photo by Robert Holmer, AVRDC)



Temporary vegetable production on banks of rivers and lakes, depending on the water level, are another form of aquatic agricultural systems.

(Top): River-bank gardens in the Mekong river flood-zone at Stung Treng on the Cambodia-Lao border (Photo by Edward Hugh Allison, *World Fish*)

(Bottom): Reservoir draw-down zone gardens at Lac Selingue, Mali (Photo by Edward Hugh Allison, *World Fish*). The hydropower reservoir also sustains a fishery, and the fishery and market gardens together provide main income sources for those who grow, fish, and trade in Bamako, which is linked to Selingue by a good new road built when the dam was constructed. One recommendation for reservoir water management decision making is that dam operations must account for local use of the drawdown zone, as well as impacts of dam operations on fisheries and ecology.



Facilitating facilitators in Sri Lanka



(Left): Participants practiced their skills in small groups. **Narinder Dhillon** (second from right) raises a discussion point; (Right): **Dhillon** (l) listens while a fellow participant shares her views.

Narinder Dhillon, AVRDC Cucurbit Breeder, joined 19 other participants in a four-day workshop, “Putting participatory values into practice,” hosted from 16-19 August 2011 by the **International Water Management Institute (IWMI)**, Colombo, Sri Lanka. Sam Kaner, regarded as one of America’s leading experts on consensus decision-making, conducted the workshop, which was designed specifically for scientists and research personnel of the Consultative Group on International Agricultural Research (CGIAR) and other

international institutes. The workshop covered ways to encourage full participation, promote mutual understanding, build a shared conceptual framework, promote inclusive/win-win solutions, build consensus, and reach closure. In small groups, participants explored techniques for polling, brainstorming, and process management; honed their listening skills; and discussed group dynamics, setting realistic goals for meetings, and other topics.

“This opportunity enabled me to acquire knowledge and skills to

effectively plan and facilitate a range of meetings, and provided ways to handle misunderstandings, conflict, confusion regarding authority, and other challenges,” said Narinder. “I met researchers from CGIAR centers and learned about their research agendas, which helped to broaden my network.” Narinder also took time to visit local vegetable markets, the cucurbit fields around the city periphery, and the National Museum.

Conference corner

XII International Society for Horticultural Science (ISHS) Symposium on the Processing Tomato

and

X World Congress on Processing Tomato

9-11 June 2012
Beijing, China

The symposium aims to bring together researchers, students, growers, and businesspeople from around the world to share the latest knowledge and advances in growing and processing tomatoes through a series of industry-science roundtables, plenary sessions, and poster sessions.

Call for papers: <http://publish.actahort.org/ishs/handle/123456789/242>

More information: www.worldtomatocongress.com



Expand your knowledge

Taking vegetables from seed to table—and beyond—demands scientific knowledge and strong technical and management skills. Join a select group of policymakers, researchers and extensionists from national and international agricultural research institutes, universities, and nongovernmental organizations for modules II and III of the **30th International Vegetable Training Course**, organized by AVRDC East and Southeast Asia, Bangkok, Thailand.



Field experiment survey, laboratory practice and group discussion during the 29th International Vegetable Training course in 2010.

Module II: From Harvest to Table

10 October to 4 November 2011

Module III: Vegetables for Sustainable Development

7 November to 2 December 2011

Spaces still open:

Register today!

Email: info-eastasia@worldveg.org

Web: <http://www.avrdc.org/index.php?id=743>

Indigenous vegetables you should know



High in beta-carotene and antioxidative compounds, the green or purple leaves of **Perilla** (*Perilla frutescens*) can be eaten fresh, stir-fried, deep-fried, or pickled. In Northeast Asia, fresh Perilla leaves often are used as edible wrappers for rice or meat, fish, or tofu. AVRDC conserves a collection of more than 10,000 indigenous vegetable species—plants with the potential to improve diets, health and livelihoods around the world.

Farewell

Congratulations!



Vegetable breeder Sokona Dagnoko said goodbye to AVRDC on 31 August 2011 after three years of service. Sokona joined the Center on 7 January 2008 to work on the Vegetable Breeding and Seed Systems for Poverty Reduction in Africa project. Her research included the adaptation of high beta-carotene tomato lines to hot, humid conditions in West Africa, and field evaluations and participatory selections of chili pepper in Mali. We wish her well in her future endeavors!



Franziska "Franzi" Beran, a former AVRDC intern in entomology, successfully defended her PhD thesis on 1 September 2011 at Humboldt-Universität zu Berlin, Germany. Franzi has a postdoctoral position at the Max Planck Institute for Chemical Ecology in Jena, where she will continue her work to understand the interactions between flea beetles (Phyllotreta striolata) and their environment that are mediated by naturally occurring chemicals.



Vivian Bernau, former AVRDC/ World Food Prize intern, recently was honored as a Future Farmers of America (FFA) American Star Award finalist in agriscience. Winners for the award will be selected at the 84th National FFA Convention, 19-22 October 2011 in Indianapolis, Indiana.

Seminars



Greg Luther, Head, Global Technology Dissemination, discussed Farmer Field Schools and other training activities in Indonesia in an R&D seminar presented to AVRDC staff on 1 September

2011. Greg reviewed the process of participatory appraisal and assessment, shared observations about the introduction of starter solution to farmers, and evaluated training of trainers' activities in integrated pest management to differentiate between pests, natural enemies, and other species.



Simone Kathrin Kriesemer, Postdoc in Socioeconomics, gave a presentation to wrap-up her three years of research at the Center on 9 September 2011. Kathrin's survey work, conducted in India, involved assessment of

consumers' food choices, farmers' pesticide use and awareness of health hazards, and evaluation of extension agents' integrated pest management knowledge.

Visitors



Sheila de Lima, Administrative and Training Officer based at AVRDC East and Southeast Asia, Thailand, visited AVRDC headquarters from 5-10 September 2011 to meet colleagues and learn more about the Center's operations. Sheila joined the Center in May, and brings a background in food science and community development to her position. She's using her extensive experience in training to coordinate the **30th International Vegetable Training Course**; Module I of the three-module course begins on September 12.

A delegation of seven representatives of the **Fujian Academy of Agricultural Sciences (FAAS)**, People's Republic of China, led by **Liu Po**, FAAS Director General, visited the Center on 31 August accompanied by **Paul Sun**, former AVRDC Board Chair. The group received a briefing from Plant Pathologist **Jaw-Fen Wang** and a tour of the Demonstration Garden from Garden Manager **Deng-lin Wu**.

(Top) **Deng-lin Wu** (l) promotes the merits of indigenous vegetables to the visitors. (Bottom left) Deputy Directory General - Research **Jackie Hughes** accepts a porcelain vase from **Liu Po**. (Bottom right) Learning about the Center's activities during a presentation.



100 farmers in the garden



On 2 August 2011, a group of **100 farmers** organized by the Commercial Office of Pathum Thani Province visited the **AVRDC East and Southeast Asia Demonstration Garden** in Kamphaeng Saen, Thailand. Research Assistant **Somchit**

Pruangwitayakun and other staffers guided the group and showed them different indigenous vegetables and improved pepper and tomato lines developed by AVRDC plant breeders. Somchit also demonstrated mature

technologies such as grafting, a technique farmers can use to grow vegetables in the off-season or in wet soils, or to avoid soil-borne diseases.



40 years of service to tropical agriculture



Four decades ago, a research and development institute dedicated to alleviating poverty and malnutrition in Asia by increasing the supply and quality of vegetables was established in Taiwan. Today, AVRDC – The World Vegetable Center operates on a global scale across Asia, Africa, and Oceania. In future issues of Fresh we will track the Center’s long and fruitful history through photos.

Vegetables – but *which* vegetables?



Center scientists made more than 500 soybean crosses in 1973.

How did AVRDC select the vegetable crops it would research? The new Center’s four plant breeders each identified a primary crop, a secondary crop and a third crop for their work. That gave 12 crops, but it soon became evident that a dozen crops were too many for the resources of a small institute. (Some international agricultural research experts felt an institute could not work effectively with more than *one* crop.) By 1973, the number had been narrowed down to six vegetables: **tomato, soybean, mungbean, sweet potato, white potato, and Chinese cabbage.** The first field experiments were planted

in early September 1973, and the first seminar to present the data was given four months later in December.



Sign at the campus entrance.



inside insight

Some previous efforts to increase crop production produced vegetables that were less, not more, nourishing.



In a 2004 study of U.S. Department of Agriculture nutritional data from 1950 and 1999 for 43 different vegetables and fruit, Donald Davis and a team of researchers from the University of Texas - Austin Department of Chemistry and Biochemistry found “reliable declines” in the amount of protein, calcium, phosphorus, iron, riboflavin (vitamin B2) and vitamin C over the past half century.

The team posited several reasons for the decrease, including depleted soils, overuse of chemical fertilizers and pesticides—and breeding. As growers and researchers tried to breed high yielding crop varieties, Davis noted they neglected to address nutrient content. The paper cited a few studies that compared high-yield varieties to non-high-yield varieties in the same soil and growing conditions, and found decreased nutrient content in the former.

Fast-forward to 2011. As awareness increases that certain foods or food components provide health and wellness benefits by reducing or minimizing the risk of some diseases, **nutritional enhancement** has become the byword for today’s plant breeders.

The aim is to develop new varieties with improved drought and heat tolerance, better pest and disease resistance—and higher concentrations of vitamins, minerals, antioxidants, and other beneficial phytochemicals.

Plant breeding for better nutrition is one of the shortest and most effective routes to improving diets around the world. That fact has long been recognized by **AVRDC – The World Vegetable Center**, where researchers have been breeding vegetables for improved nutritional quality for many years. Decades of work with partners in Asia to develop **mungbean** lines with improved agronomic characteristics did not ignore nutrition; the Center’s improved lines doubled the amount of iron per 100 grams of the legume compared with traditional varieties. Just one of the Center’s **high beta-carotene tomatoes**, first introduced in 2004, fulfills the body’s daily requirement for vitamin A. Improved **indigenous leafy greens** such as amaranth lines Ex-Zim and AM 38 released in Tanzania and Mali in 2010, add more nutrients to daily diets while increasing incomes for small-scale farmers.



High beta-carotene cherry tomatoes:
Nutritious, hardy, productive -- and tasty!

The **Global Partnership Initiative for Plant Breeding**, a platform facilitated by the UN Food and Agriculture Organization, aims to address malnutrition and obesity-related diseases through breeding to improve the nutritional value of vegetables, fruit, and staple crops. Consumers everywhere, but especially those in developing countries, will benefit when farmers have access to improved seed of more nutritious vegetable varieties.

Global Partnership Initiative for Plant Breeding

<http://km.fao.org/gipb/index.php>