Partnerships advance in Southeast Asia

Contact with current and potential partners in Malaysia holds promise for the region

June 2015 was the occasion for a productive trip to Malaysia for AVRDC representatives Deputy Director General – Research Jackie Hughes, Regional Director for East and Southeast Asia Fenton Beed and Program Assistant Jui-Kai Li. They discussed preparations for the next SEAVEG symposium, and explored possibilities to enhance AVRDC’s networks and create new partnerships with four major organizations based in Malaysia.

SEAVEG2016

The SEAVEG regional symposium addresses the challenge of sustaining small-scale vegetable production and marketing systems for food and nutrition security in Southeast Asia. The first two conferences were held in Thailand in 2012 and 2014, and SEAVEG2014 successfully gathered over 200 scientists from more than 20 countries.

(...continued on page 2)
SEAVEG2016 will be hosted by the Malaysian Agricultural Research and Development Institute (MARDI) in Kuala Lumpur from 13-15 September 2016. Members of the SEAVEG coordination/steering committee, Prem Nath (SEAVEG Steering Committee; Chair), Jackie Hughes (SEAVEG Vice-Chair) and Fenton Beed, were invited to MARDI’s headquarters to discuss the symposium. During the meeting, Umi Kalsom (MARDI Deputy Director General) confirmed MARDI’s enthusiasm and capacity to host SEAVEG2016. Organization of the symposium at the national level will be led by MARDI’s Omran Hashim; MARDI’s Director General, Dato’ Sharif Haron, will join the SEAVEG Steering Committee. The committee is deliberating on an appropriate theme for the symposium; nutrition has been highlighted as a key topical issue. MARDI will prepare the symposium’s official announcement text and logo.

In mid-August the SEAVEG2016 committee will convene to finalize the program, including technical and inaugural sessions, venues, sub-committees and fundraising initiatives.

Potential for partnerships

For the first time, AVRDC representatives visited the Malaysian offices of the Indonesia-Malaysia-Thailand Growth Triangle (IMT-GT) and World Vision. They also made a courtesy call to Crops For the Future (CFF), a member of the Association of International Research and Development Center (AIRCA).

CFF is funded by the Malaysian government and is the world’s first center dedicated exclusively to research on underutilized crops. With a large scope of activities, from fundamental genetics research to end users and policies, the organization promotes the use of underutilized crops to diversify agricultural systems, especially in developing regions of the world. AVRDC representatives visited the construction site of CFF’s future headquarters, an impressive structure of three domes to be surrounded by a botanical garden that will demonstrate the use of green technologies. An invigorating meeting with CFF’s Chief Executive Officer, Prof. Sayed Azam-Ali, touched on the AIRCA community of practice for research and development, of which both AVRDC and CFF are members. CFF is a young organization with a clear strategy and strong leadership; there is great potential for collaboration with AVRDC in the near future, and opportunities to host joint students were explored. CFF will be invited to participate in the ASEAN-AVRDC Regional Network for Vegetable Research and Development (AARNET) meeting, and AVRDC
Representatives will soon return to CFF headquarters for the opening of its new facilities in September.

The AVRDC delegation then visited the Center for the Indonesia-Malaysia-Thailand Growth Triangle Sub-regional Cooperation (CIMT). “The IMT-GT is a sub-regional cooperation initiative founded by the governments of Indonesia, Malaysia, and Thailand to accelerate economic transformation in less developed provinces,” said Pairote Potivong, CIMT Director. The organization has developed strong competencies in connecting regional groups and today its activities encompass more than 32 provinces and states serving more than 70 million people.

The Association of Southeast Asian Nations (ASEAN) Secretariat is a valuable ally for IMT-GT that provides support and linkage for regional cooperation in ASEAN. “There could easily be synergies and opportunities to work together,” said Jackie Hughes, opening the door for future collaboration. The representatives discussed the potential involvement of IMT-GT in the next AARNET meeting that will be held in Malaysia in 2016.

The delegation’s last stop was a visit to World Vision, a Christian humanitarian organization dedicated to improving children’s health, protection and education throughout the world. With 46,000 staff members worldwide, the organization assists children and communities in nearly 100 countries. This was the first time AVRDC met formally with World Vision to discuss opportunities to improve rural and urban household nutrition and income generation through vegetable-based systems. AVRDC germplasm and technical expertise in areas such as home gardening and vegetable grafting, and the World Vision platform and connections within East and Southeast Asia could lead to successful agricultural interventions in the region.

Before leaving Malaysia, the AVRDC representatives met with Keng-Yeang Lum, chief scientist at CABI Malaysia. CABI, an international not-for-profit organization that is also a member of AIRCA, provides scientific expertise to solve problems in agriculture and the environment in more than 70 countries.

MARDI
http://www.mardi.gov.my/

Crops for the Future
http://www.cropsforthefuture.org/

World Vision
http://www.worldvision.org/

CABI
http://www.cabi.org/
MoUs FOR MALI AND BURKINA FASO: AVRDC – The World Vegetable Center recently signed three memoranda of understanding with two West African countries. On 28 May 2015, Director General Dyno Keatinge inked agreements with L’Institut de l’Environnement et des Recherches Agricoles (INERA) and Director Hamidou Traoré (1), and with Le Ministere de la Recherche Scientifique et de l’Innovation (MRSI) led by Minister Jean Noël Poda, in Ouagadougou, Burkina Faso (2). While in Burkina Faso, Dyno also took the opportunity to check in with Taiwan ambassador Shen Chen-Hong (3) and Robert Ouedrago, Senior Advisor to the Minster of Agriculture and Food Security, who has been active in the Vegetables Go to School project (4). Dyno, AVRDC West and Central Africa Regional Director Abdou Tenkouano, and INERA’s Hamidou Traoré (5). On 1 June, the DG traveled to Bamako, Mali, where an MoU was signed with L’Institut d’Économie Rurale (IER) and Director General Bourema Dembele (6). The agreements will guide the Center’s future activities and collaborations with the two countries. The DG also toured screenhouse facilities at the Samanko Research Station in Mali with Vegetable Breeder Jean-Baptiste Tignegre, AVRDC West and Central Africa Regional Director Abdou Tenkouano, and AVRDC staff (7). The West Africa team took the occasion of the DG’s visit to present him with a special hand-tooled image created from a photograph (8).
Welcome

Mark Robert Sabol from South Seneca High School, Ovid, NY, USA and a World Food Prize Foundation Summer Intern at AVRDC headquarters from 17 June to 14 August 2015 is studying “Cultivation and nutritional quality of vegetable cowpea” and “Evaluation of Basella” with the Indigenous Vegetables Group under the supervision of Peter Hanson and Ruby Hsiao. Welcome, Mark!

AIRCA NEWSLETTER LAUNCHED: The Association of International Research and Development Centers for Agriculture (AIRCA), recently posted its first newsletter. AVRDC is a founding member of AIRCA, a nine-member alliance focused on increasing global food security by supporting smallholder agriculture within healthy, sustainable, and climate-smart landscapes. To subscribe to the newsletter, send your email address to: mdieling@airca.org

Recent publications from AVRDC researchers


In 2009, Sreenivasa Rao from the Indian Institute of Horticultural Research, Bengaluru received a 1-year Boycast Fellowship from the Department of Science & Technology of the Government of India and joined AVRDC to conduct work on the Center’s Solanum pimpinellifolium germplasm collection, including salinity tolerance screening. Dr. Rao’s third publication based on his AVRDC research (Variations in DREB1A and VP1.1 genes show association with salt tolerance traits in wild tomato) was recently accepted for publication by the journal PLoS One. The other two publications:


The Center in the news

**Dawn News** reported on AVRDC’s efforts to promote mungbean intercropping with sugarcane in Pakistan:

**Farm Radio International** and AVRDC are helping farmers stay up-to-date on market information via radio and cell phones. Learn more about how Radio 2.0 is connecting farmers to markets: http://www.farmradio.org/ourblog/2015/06/10/farm-to-market-radio-2.0/

The Center’s new “Beans with Benefits” project got a bump from the May 2015 **CAC Newsletter**. The three-year project aims to improve farmer incomes and increase the sustainability of dry-land production systems in Pakistan and Uzbekistan through the adoption of improved mungbean varieties:

**BioPortfolio** also shared the article:

The 11 June 2015 issue of the prestigious science journal, **Nature**, featured an extensive report on indigenous vegetable crops in Africa. AVRDC’s **Andreas Ebert** and **Fekadu Dinssa** were among those interviewed for the article:

**Seminars**

**Jeroen Rouppe van der Voort**, Biotechnology Director, Enza Zaden Research and Development B.V., Enkhuizen, The Netherlands, spoke to AVRDC staff about “Next generation breeding at Enza Zaden” on 23 June 2015 at headquarters. He also met with the Center’s plant breeders and biotechnologists to discuss opportunities for collaborative research. Enza Zaden has been a leading vegetable breeding company for more than 75 years, with a crop portfolio that includes tomato, cucumber, sweet pepper and leafy vegetables.
Visitors

Students from the National Pingtung University of Science and Technology, Taiwan enjoyed a visit to AVRDC headquarters and the Demonstration Garden on 8 June 2015.

Vo Quan Huy, President of Cty Cp Dau Tu Ket Phat Thinh Co. and Tran Van Thanh, president of Cong Ty Tnhh Thuong Mai Phong Tuong Co., Vietnam, visited the Demonstration Garden, Genebank, and fertigation greenhouses on 10 June 2015.

Esam Mustafa Abdulrazaq Idris, Acting Director, Plant Wealth Directorate, Ministry of Works, Municipalities Affairs and Urban Planning, Bahrain, accompanied by staff from Taiwan’s Ministry of Foreign Affairs, toured headquarters on 30 June 2015.

Jim Godfrey, a member of the International Rice Research Institute’s (IRRI) Board of Trustees, met with Center management and staff on 29 June 2015 at headquarters. During a roundtable discussion, he shared his insight on future CGIAR and IRRI systems initiatives.

Jim Godfrey

A group of four editors led by Kathy Cheng, Managing Editor of Scientific American Chinese Edition, visited the Center on 7 July 2015 for a tour and briefing by Deputy Director General – Administration & Services Yin-fu Chang.
School gardens thriving in Bhutan

Enjoy these great photos from Bhutan teachers Tashi Tenzin, Choki Gyeltshen, Tendel Tshering, and Bartsham Karma Rinzin. Their schools are participating in the Vegetables Go to School project, funded by the Swiss Agency for Development and Cooperation.

1. Taking notes on crop development in the school garden beds. (Photo by Tendel Tshering)
2. A principal presents students with pencil cases printed with the words “Eat more Vegetables!” in Dzongkha — a quick reminder to enjoy a healthy diet.
3. Daikon, or winter radish, grows fast and has a mild flavor children like. (Photo by Choki Gyeltshen)
4. Proud school gardeners display their harvest! (Photo by Choki Gyeltshen)
5. Spinach provides iron and other important nutrients to the diet. (Photo by Choki Gyeltshen)

(...continued on page 9)
Vegetables Go to School seeks to address malnutrition, particularly among children, by establishing comprehensive school vegetable garden programs in Bhutan, Nepal, Burkina Faso, and Indonesia.

Successful school vegetable gardens aim to:

- achieve better understanding of biological processes and sustainable agricultural practices
- promote environmental awareness
- provide better information about healthy food choices
- promote sanitation and hygiene
- reduce the cost of food and provide a safety net for poor people by giving them the ability to grow their own food

1. Don’t take germs to lunch!
2. A simple reminder can prevent the spread of disease.
3. Chickpea sprouts make a nutritious addition to school canteen meals.
4. A tasty, fresh and healthy salad of mungbean sprouts, tomato and red onion.

(Photos by Tashi Tenzin)
The inception workshop for the project “Beans with Benefits: Integrating improved mungbean as a catch crop into the dryland systems of South and Central Asia for increased smallholder farmer income and more sustainable production systems” was held on 6-7 May 2015 in Tashkent, Uzbekistan. The project, funded by Gesellschaft für Internationale Zusammenarbeit (GIZ), aims to diversify local production systems with mungbean for its contribution to soil fertility and potential for income generation. Twenty participants from AVRDC; GIZ; University of Hohenheim; International Center for Agricultural Research in the Dry Areas (ICARDA); International Water Management Institute (IWMI); the Uzbek Ministry of Agriculture and Water Resources; Scientific Production Center of Agriculture; Research Institute of Plant Industry; and Microbiology Institute attended the workshop.

Smallholder farmers in dryland areas of project countries Pakistan and Uzbekistan typically depend on a narrow range of crops (cereals and/or cotton), which fetch low market prices and deplete nitrogen and organic matter in the soil. Farmers have limited access to rotation crops that could generate additional income and reverse the nutrient depletion of soils. In some regions, salt accumulation in soils as a consequence of inappropriate irrigation restricts crop diversification options and contributes to low farming productivity and environmental degradation. Farmers find themselves trapped in production systems that are unprofitable and unsustainable; the outcome of this is a downward spiral to poverty.

Mungbean is a nutritious warm season legume crop. The grains are rich in protein, minerals and vitamins, and are a popular ingredient in Uzbek and Pakistani cuisines. The leaves of immature plants can serve as animal feed. Due to its short duration, it easily fits into established cropping calendars. Mungbean fixes nitrogen in the soil, requires less water, and tolerates more heat than other legumes.

Workshop participants discussed recent mungbean research, improved varieties and production technologies, trial designs, nitrogen fixation and soil quality studies, and microbiology and seed inoculation studies. Pathways for improved mungbean uptake were reviewed, and work plans, responsibilities and tasks agreed among partners. The group also took a field tour to the Research Institute of Plant Industry, Kibray district, Tashkent.
AVRDC - The World Vegetable Center and the Asian Food and Agriculture Cooperation Initiative (AFACI) in collaboration with the Rural Development Administration (RDA) of Korea and Thailand’s Department of Agriculture successfully organized the first “International training workshop on postharvest management technology for horticultural crops” from 8 to 19 June 2015 in Thailand. Twenty-two participants from 11 AFACI member countries (Bangladesh, Cambodia, Indonesia, Kyrgyzstan, Laos, Mongolia, Nepal, Philippines, Sri Lanka, Thailand, and Vietnam) attended the workshop, which covered sessions on postharvest losses, biology, seed technology and nutrition; pack house operations, packaging and storage; postharvest handling systems; quality evaluation, disorders and processing; and industry practice.

Surmsuk Salakpetch, Deputy Director General, Department of Agriculture, Thailand, Jackie Hughes, AVRDC Deputy Director General Research, and Kwon Do Ha, AFACI Deputy Secretary General, welcomed the participants. Ji Gang Kim, Director, National Institute of Horticultural and Herbal Science and a representative of RDA, gave the opening address on behalf of AFACI. Fenton Beed, Regional Director, AVRDC East and Southeast Asia, gave an overview of the Center’s programs and activities in the region. Andreas Ebert, AVRDC Genebank Manager, set out the objectives, processes and activities for the workshop.
Participants attended expert lectures, engaged in discussions and practical exercises, and visited facilities implementing good agricultural and manufacturing practices in production, quality assurance, postharvest management and marketing in Chiang Mai, Lampun, Bangkok, Nakhon Pathom and Samut Sakhorn. Experts sharing their knowledge and expertise from AVRDC included Shriniwas Gautam, Monitoring and Evaluation Specialist; Andreas Ebert; Ray-yu Yang, Nutritionist; and Yoonpyo Hong and Jun Acedo, Postharvest Specialists. From the Horticulture Innovation Lab at Kasetsart University, Jingtair Siriphanich, Head of the Postharvest Technology Center, and postharvest experts Teeranud Romphopak, Kietsuda Luangwilai, Wachiraya Imsabai and Apita Bunsiri provided insight and guidance. Panida Boonyarittthongchai and Apiradee Uthairatanakij from the Postharvest Technology Division of King Mongkut’s University of Technology Thonburi, Ji Gang Kim, RDA Processing Expert, and Amara Chinaphuti and Bussara Chankaewmanee from DOA also presented valuable perspectives on postharvest issues.

Participants presented the postharvest situation in their countries, highlighting the contribution of fruit and vegetables to the agricultural economy; postharvest practices, problems and losses; and causes and interventions to reduce losses and increase market advantage of smallholders. Based on the knowledge gained in the workshop, the participants successfully presented country action plans with strategies to improve postharvest practices along the value chain.

The Postharvest Working Group Asia was formed during the course. This network will serve as a platform for experts and participants to continue sharing knowledge, information, practices, learning and updates on the progress of various country initiatives.
Cherry tomato cheers a grower in Bangladesh

A successful summer tomato grower, Mohamed Mohiuddin Fakir, is now a pioneer of cherry tomato production in Ghoradoho village, Faridpur district, Bangladesh. Mr. Mohiuddin and his wife, son and daughter-in-law cultivate rice and a few vegetables such as onion, winter tomato, summer tomato, cabbage, cauliflower and cucumber in an 80 m² garden in front of their home. Mr. Mohiuddin participated in summer tomato training offered by AVRDC through the USAID Horticulture Project, where he learned grafting, rain shelter construction and other techniques for cultivating tomato during the hot, wet season. Personnel from project partners AVRDC and the International Potato Center (CIP) appreciated his commitment and skill, and encouraged him to try growing cherry tomato as well. With a sample of ‘BARI Tomato 11’ seed from the project, he planted about 800 m² surrounding his home with cherry tomato. Project staff visited his field and provided technical assistance. Yields were high (49.5 ton/hectare) and Mr. Mohiuddin was delighted—until it was time to sell the produce. Cherry tomato is a new crop for Bangladesh, and many consumers unfamiliar with the small fruits thought they came from old or diseased tomato plants. Initially, Mr. Mohiuddin and other producers were able to get only 10 to 15 TK per kilogram (USD 1 = 77.5 TK) for their cherry tomatoes.

To remedy the situation, project staff met with representatives from supermarkets and malls in Dhaka to introduce them to the new vegetable. German Butcher, a supermarket, agreed to purchase some cherry tomato, and three others (AGORA, Levender, and CSD) soon followed. From September 2014 to May 2015 Mr. Mohiuddin supplied 2.19 tons of cherry tomato to the four supermarkets, with sales of 357,436 TK (USD 4612). His net profit was 107,436 TK (USD 1386) from only 800 m² land. He used his cherry tomato profits to invest in other activities such as seed production and fish culture. He harvested 3 tons of quality rice seed and 22 kilograms of onion seed with a market value of 170,000 TK ($2193).

Mr. Mohiuddin introduced his family, neighbors, relatives and local leaders to cherry tomato; now he, his family and others are consuming this nutritious vegetable and benefiting from the vitamins and minerals it provides. Mr. Mohiuddin is planning to grow his next crop of cherry tomato in staggered plantings, to ensure this new moneymaker will produce a steady income over many months.
Breeders in Pakistan using AVRDC germplasm

An elite mungbean line developed through hybridization of AVRDC genotype VC 1482E with NM 20-21, a local NIAB variety, has been recommended by the Experts’ Subcommittee of the Punjab Seed Council to be released as a commercial variety, with the proposed name of **NIAB MUNG 2015**. Distinguishing features of the variety include an erect growth habit; top-bunching pods; bold, shiny seeds; top late pods with viable and bold seeds; and resistance against mungbean yellow mosaic disease, lodging, and shattering. The release of this variety will help sustain mungbean production in Pakistan; due to its unique characteristics, it is the first variety suited for mechanical harvesting with a combine.

NIAB has developed three candidate lines (MM 0513, MM 044 and MH 34143) with AVRDC germplasm. DUS (distinct, uniform, stable) studies of MM 0513 are in progress; MM 044 and MH 34143 have been included in a national uniform yield trial.

Twelve genotypes from AVRDC germplasm (VC 2768A, VC 2768B, VC 1560D, VC 1482E, VC 6370A, VC 1006C, VC 2565, VC 1945, VC 2307A, VC 1973A, VC 5734A and VC 6144B) were used to create new genetic variants through hybridization and induced mutations. From these variants, 322 new mungbean genotypes with unique features were developed. Out of these, 166 are being evaluated in different yield trials at NIAB, and the remaining 156 genotypes with distinct features were added to NIAB’s mungbean gene pool. Ninety-five single plant progenies are under evaluation in different segregating generations (M2, M3, M4, M5, M6, F2, F3, F4, F5 and F6). Moreover, eight fresh crosses have been made and 20 new mutants developed from AVRDC germplasm.

NIAB recently received an Achievement Award from the International Atomic Energy Agency (IAEA). Among about 200 member countries, only NIAB Pakistan won this award. AVRDC congratulates NIAB and looks forward to future fruitful collaboration.

<table>
<thead>
<tr>
<th>VARIETY Name</th>
<th>YEAR of Release</th>
<th>PARENTAGE</th>
<th>Yield Potential (kg/ha)</th>
<th>DISTINCT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIAB Mung 51</td>
<td>1990</td>
<td>VAR 6601 x VC 1973A*, 100 Gy (F1 Mutation)</td>
<td>2074</td>
<td>Large seed size, early maturity, non-shattering, resistant to lodging, resistant to Mungbean yellow mosaic virus (MYMV) and Cercospora Leaf Spot (CLS) and more seed yield (21-26%) than standard check variety NM 121-25.</td>
</tr>
<tr>
<td>NIAB Mung 54</td>
<td>1990</td>
<td>VAR 6601 x VC 1973A*, 100 Gy (F1 Mutation)</td>
<td>1867</td>
<td>Bold seed size, early maturity, non-shattering, resistant to lodging, Mungbean yellow mosaic virus (MYMV) and Cercospora Leaf Spot (CLS) and 21-26% higher seed yield than standard check variety NM 121-25.</td>
</tr>
<tr>
<td>NIAB Mung 92</td>
<td>1996</td>
<td>NM 36 x VC 2768B*</td>
<td>2548</td>
<td>Matures ten days earlier than other varieties. Seed yield greater than the parent NM-36 (51%, and 34%) and both the standards checks NM121-25 and NM51, respectively, less plant height, more seed size as compared to standard check NM 51. It has been under cultivation in some South Asian countries.</td>
</tr>
<tr>
<td>NIAB Mung 98</td>
<td>1998</td>
<td>NM 20-21 x VC 1482E*</td>
<td>2902</td>
<td>Highly resistant to MYMV, purple hypocotyl, semi-erect growth habit, later than NM 92, light green leaf and stem color, higher number of pods, resistant to diseases, shiny seed coat color, best suited for spring planting and has 20% edge in seed yield than check variety NM 51.</td>
</tr>
<tr>
<td>NIAB Mung 2006</td>
<td>2006</td>
<td>VC 1560D x NM 92</td>
<td>2988</td>
<td>High yielding (27% edge over NM 92), resistance against diseases, greater number of pods, more seed size, presence of anthocyanin pigments in stem, petiole and leaf venations give it a purple look, which can be used as an identification marker.</td>
</tr>
<tr>
<td>NIAB Mung 2011</td>
<td>2011</td>
<td>VC 1482E* x NM 20-21</td>
<td>2877</td>
<td>High yielding (12% edge over NM 2006), resistance against diseases, greater number of pods, higher seed size, purple hypocotyl base and green stem color, erect growth habit, synchronous pod maturity, long pod, top late pods having normal viable seeds.</td>
</tr>
</tbody>
</table>

*AVRDC Germplasm

Pakistan’s **Nuclear Institute for Agriculture & Biology** (NIAB), Faisalabad has been a long-time collaborator with AVRDC. Since 1990, NIAB has released 11 varieties of improved mungbean. Six of those mungbean varieties (NM 51, NM 54, NM 92, NM 98, NM 2006 and NM 2011) used AVRDC germplasm as parent material for breeding.

The improved varieties contribute to Pakistan’s economy as well as to the incomes of growers throughout India, Nepal, Bangladesh, Burma, Sri Lanka and other countries where NIAB varieties were either released for general cultivation or used in breeding programs for desirable traits such as resistance to **Mungbean yellow mosaic virus (MYMV)** and earliness. NIAB’s NM-92 is the best source of earliness in mungbean.

<table>
<thead>
<tr>
<th>VARIETY Name</th>
<th>YEAR of Release</th>
<th>PARENTAGE</th>
<th>Yield Potential (kg/ha)</th>
<th>DISTINCT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIAB Mung 51</td>
<td>1990</td>
<td>VAR 6601 x VC 1973A*, 100 Gy (F1 Mutation)</td>
<td>2074</td>
<td>Large seed size, early maturity, non-shattering, resistant to lodging, resistant to Mungbean yellow mosaic virus (MYMV) and Cercospora Leaf Spot (CLS) and more seed yield (21-26%) than standard check variety NM 121-25.</td>
</tr>
<tr>
<td>NIAB Mung 54</td>
<td>1990</td>
<td>VAR 6601 x VC 1973A*, 100 Gy (F1 Mutation)</td>
<td>1867</td>
<td>Bold seed size, early maturity, non-shattering, resistant to lodging, Mungbean yellow mosaic virus (MYMV) and Cercospora Leaf Spot (CLS) and 21-26% higher seed yield than standard check variety NM 121-25.</td>
</tr>
<tr>
<td>NIAB Mung 92</td>
<td>1996</td>
<td>NM 36 x VC 2768B*</td>
<td>2548</td>
<td>Matures ten days earlier than other varieties. Seed yield greater than the parent NM-36 (51%, and 34%) and both the standards checks NM121-25 and NM51, respectively, less plant height, more seed size as compared to standard check NM 51. It has been under cultivation in some South Asian countries.</td>
</tr>
<tr>
<td>NIAB Mung 98</td>
<td>1998</td>
<td>NM 20-21 x VC 1482E*</td>
<td>2902</td>
<td>Highly resistant to MYMV, purple hypocotyl, semi-erect growth habit, later than NM 92, light green leaf and stem color, higher number of pods, resistant to diseases, shiny seed coat color, best suited for spring planting and has 20% edge in seed yield than check variety NM 51.</td>
</tr>
<tr>
<td>NIAB Mung 2006</td>
<td>2006</td>
<td>VC 1560D x NM 92</td>
<td>2988</td>
<td>High yielding (27% edge over NM 92), resistance against diseases, greater number of pods, more seed size, presence of anthocyanin pigments in stem, petiole and leaf venations give it a purple look, which can be used as an identification marker.</td>
</tr>
<tr>
<td>NIAB Mung 2011</td>
<td>2011</td>
<td>VC 1482E* x NM 20-21</td>
<td>2877</td>
<td>High yielding (12% edge over NM 2006), resistance against diseases, greater number of pods, higher seed size, purple hypocotyl base and green stem color, erect growth habit, synchronous pod maturity, long pod, top late pods having normal viable seeds.</td>
</tr>
</tbody>
</table>
Best practices in Pakistan

AVRDC South Asia is making continuous efforts to maximize agricultural development in Pakistan by implementing specific solutions to the social and technological challenges farmers face. Here are a few ways farmers and workers are being enabled to be more productive in the field and after the harvest:

**PULP FACT, NOT FICTION:** Tomato pulp produced during seed extraction can be processed into sauces and juice, providing women farmers and workers with a new income stream and more nutritious food throughout the year. In a training session organized in conjunction with the Agricultural Research Institute (ARI) on 5 June in Dera Ismail Khan, 26 participants learned valuable skills and methods to collect and process tomato pulp. Sadaf Javeria, Assistant Professor of Food Technology, Gomal University, demonstrated how to make different products using tomatoes and answered participants’ questions about the various techniques. AVRDC Research Associate Faiza Mushtaq, and Training Expert/Ag Extensionist Sheeraz Ahmad facilitated the training, along with Abdul Qayum from ARI.

*MUNGBEAN & SUGARCANE:* Intercropping mungbean with sugarcane began last year in Toba Tek Singh district under the Agriculture Innovation Program (AIP). A Field Day was organized in Bariyaran village in Toba Tek Singh on 9 June 2015 to give a new group of farmers exposure to this cropping technology. Around 200 participants attended the event. Asghar Ali, AVRDC Legume Agronomist, told the farmers there is great potential to improve mungbean production in the district, where sugarcane is grown on 70-80,000 acres that can successfully support intercropped mungbean. Ch. M. Rafiq, Director of Pulses, Ayub Agricultural Research Institute (AARI), Faisalabad said mungbean offers many benefits to farmers, and extended his cooperation to guide farmers who want to begin intercropping the legume. Mansab Ali, Team Leader, AVRDC Pakistan invited the farmers to see the crop in the field and encouraged them to adopt it. He acknowledged the effort of AIP-AVRDC and AARI staff to make the technology and the Field Day successful. The event was part of the Agricultural Innovation Program (AIP) for Pakistan funded by the United States Agency for International Development (USAID) and supported by the International Maize and Wheat Improvement Center (CIMMYT), Pakistan Agricultural Research Council (PARC) and Ayub Agricultural Research Institute (AARI).

(...continued on page 16)
SEED SESSION: An introduction to “Quality Onion Seed Production and Packing” for local dignitaries and farmers was hosted in Umerkot by the Agriculture Innovation Program for Pakistan (AIP) on 10 June 2015 in collaboration with the Arid Zone Research Institute (AZRI) - Umerkot, and Becon Seed Company, Kunri-Sindh. Seed of two onion varieties, Phulkara and Nasarpuri, was packed and made available for marketing. **Ali Mardan Shah (2nd from right),** Minister for Population and Welfare, Government of Sindh, was the Chief Guest along with 20 progressive farmers from the districts of Umerkot and Mirpurkhas. **Mazullah Khan (right),** AVRDC Vegetable Seed Specialist, demonstrated seed packaging methods to the participants. The minister expressed appreciation for the transfer of innovative production technologies to the farmers, and suggested AVRDC expand field activities in Sindh to reach out to a large number of farmers. This AIP event was funded by the United States Agency for International Development (USAID) and supported by the International Maize and Wheat Improvement Center (CIMMYT), and AZRI - Umerkot of the Pakistan Agricultural Research Council (PARC).

HEALTHY SEEDLING PRODUCTION: In collaboration with the Horticulture Research Station (HRS), Naushera and Barani Agricultural Research Institute (BARI) Chakwal (Punjab, Pakistan), AVRDC organized a one-day training program on “Healthy vegetable seedling production and IPM” on June 6 in Soon Valley. Twenty men farmers from the area learned about site selection, soil media, seed bed preparation, seed selection, sowing and germination, nursery management, and IPM. **Naveeda Anjum** (Assistant Horticulturist), **Gulam Jelani** (Program Lead-Vegetables, NARC Islamabad) and **Malik Allah Bakash** (Horticulturist, HRS, Naushera) served as resource persons; **Nazim Ali** (USAID Representative for the Agricultural Innovation Program (AIP) and **Mansab Ali** (Team Leader, AVRDC) attended the training.

**RD in PAKISTAN:** Warwick Easdown, Regional Director, AVRDC South Asia, was in Pakistan from June 17-19 to review progress with the AIP team and to view field trials of leafy vegetables raised under green net during the summer season at Haripur district, Khyber Pakhtunkhwa. He also inaugurated the meeting room at the AVRDC Pakistan office, recently acquired from the National Agricultural Research Council (NARC). Warwick met with **Iftikhar Ahmad**, Chairman, Pakistan Agricultural Research Council (PARC) and **Mansab Ali**, AIP Team Leader to discuss ways to strengthen the technical relationship further in the coming years. Dr. Easdown mentioned that AVRDC is leading a three-year project called “Beans with Benefits” funded by the Federal Ministry for Economic Cooperation and Development of Germany from April 2015 to March 2018; the project aims to improve farmer incomes and increase the sustainability of dry-land production systems in Pakistan and Uzbekistan through the adoption of improved mungbean varieties.
Home garden seed kits: a sustainable business model

Home garden seed kits pioneered by AVRDC – The World Vegetable Center four years ago in Jharkhand in eastern India have now stimulated entrepreneurs to supply growing demand for the kits. More than 80,000 households in Jharkhand and neighboring states now enjoy a variety of vegetables in their meals because of the seed kits. The vegetables contribute much needed vitamins and minerals to the diet, and are a tasty complement to the local staple, rice.

To date, about 13,000 seed kits have been sold throughout Jharkhand, West Bengal, Orissa, Madhya Pradesh, Chhattisgarh, Bihar, Andhra Pradesh and Goa, and several types have been developed for different audiences and needs. To grow a home garden, families need good quality seed of diverse crops in small amounts suited to their garden size.

In 2008, AVRDC launched a project on “Improving vegetable production and consumption for sustainable rural livelihoods in Jharkhand and Punjab, India” funded by the Sir Ratan Tata Trust (SRTT). In rural Jharkhand, five nongovernmental organizational partners worked with AVRDC to implement home gardens for more than 5000 farmers, using seed provided by AVRDC. Farmers were trained to produce and store their own seeds, and many have been able to grow home gardens year after year as a result.

When home gardens became popular beyond the project area, demand for quality seed kits soon outstripped supply. AVRDC decided to produce kits with diverse seeds for year-round vegetable production. Krishi Gram Vikas Kendra (KGVK), one of AVRDC’s NGO partners in Jharkhand, was contracted to create 1500 kits containing seed of 20 different vegetables with a buy-back provision to reduce risk. Demand started to expand for the INR 300 (US $5) kits—which contained small seed packs mounted on a wall poster—as farmers’ groups as well as NGOs sought them out.

In October 2013, Rajesh Singh, an agriculture postgraduate, left KGVK to found the Mahatma Buddha Agriclinic and Agribusiness Centre in Gaya, Bihar. He sold home garden seed kits and also got a government contract to train 720 local women farmers to establish their own home gardens. He then began to customize the seed packs for different seasons and supply inputs. His first version had kits for the winter, summer and rainy seasons with seed packets mounted on three different leaves of a wall calendar. He supplied this along with a drip irrigation kit, seedling trays and cocopeat for INR 4000 (US $60). Although he sold 770 kits in Bihar and Madhya Pradesh, the price was too expensive for most farmers.

His next version was simpler, with seed for just one season combined with two seedling trays, one kilo of cocopeat, a small garden hand tool (khurpi), neem oil for insect control and a small hand sprayer for INR 650 (US $10). He sold 1500 kits in Bihar and Madhya Pradesh.

Seed was the most popular component of the kits, because small quantities of good seed of diverse vegetables are hard to obtain. So his third and most profitable version contained small...
seed packets of 10 vegetables for each season and sold for INR 400. He recently got an order for 3000 kits from different districts of Bihar.

The three kit types are all selling well. Each kit contains a leaflet explaining the benefits of home gardens, and instructions on how to grow healthy seedlings using nursery trays.

But there’s more....

Another former employee of KGVK, Mohit Kumar, started his own firm called Agro Vision to manufacture small agricultural hand tools including portable nets to exclude insects—another idea promoted by the AVRDC project in Jharkhand. The two entrepreneurs combined forces and products, and now sell kits that include Mr. Singh’s best-selling seed packs and Mr. Kumar’s nets to grow healthy vegetable seedlings.

The project led by AVRDC is now reaching tens of thousands of households not only in Jharkhand but well beyond the original target area because the ideas it promoted made economic sense to astute individuals who have made its impact sustainable. It shows that a good exit strategy is just as important for the success of a project as the ideas it promotes.
After three days of discussions, field and market visits, Ye Tint Tun, Director General of the Department of Agricultural Research (DAR), signed a partnership agreement on 1 July 2015 with AVRDC – The World Vegetable Center for a project to select tropically adapted lines of pumpkin, bitter gourd, chili and tomato to improve the vegetable value chain in Southeast Asia. The project will be funded by the Ministry of Agriculture, Forestry and Fisheries (MAFF), Japan.

A workplan was enthusiastically developed by the DAR Horticulture team led by Than Than Nu and Narinder Dhillon of AVRDC. Plans were made for partnerships and capacity building initiatives between the genebanks of AVRDC and DAR.

“The benefit of this visit was to initiate work plans and to understand the production constraints of current varieties, preferences of growers, distributors, retailers and consumers, and markets for the MAFF project’s target crops,” said Dhillon, AVRDC’s Cucurbit Breeder. Landraces and locally favored varieties will be compared with genetically improved lines from AVRDC in Myanmar and also Vietnam under this project. Lines that show superior traits, especially disease resistance, will be demonstrated during farmer field days and made available for incorporation into breeding programs in Myanmar and Vietnam, or included in national variety trials for potential release.

AVRDC East and Southeast Asia Regional Director Fen Beed commended the team spirit and integration of staff of all levels of DAR and the combined levels of knowledge and enthusiasm. Ye Tint Tun demonstrated his interest in the success of this project and welcomed collaboration with AVRDC and future partnership opportunities.
AVRDC – The World Vegetable Center organized a seed multiplication training session from 11-12 June 2015 in Ouagadougou to ensure vegetable producers are equipped with the knowledge and skills they need to save quality seed for future planting. The training falls under the project “Enhancing Productivity, Competitiveness and Marketing of Traditional African Vegetables (TAV) for Improved Income and Nutrition in West and Central Africa” commissioned by West and Central African Council for Agricultural Research and Development (CORAF/WECARD).

Thirty-two participants (28 men, 4 women) from the East region of Burkina Faso attended the course; they were nominated by Burkina Faso-based project partners Helen Keller International (KHI) and Africa’s Sustainable Development Council (ASUDEC).

Farmers’ access to quality seed is fundamental to the development of traditional African vegetable production. Klaus Fleissner and Lyliane Pousseu from AVRDC Cameroon trained participants on the recommended methods and techniques of producing quality seeds. Hadja Barry and Semde Abdoulaye from the National Seed Service exposed participants to seed policies and regulations, and the processes of seed quality certification in Burkina Faso. AVRDC’s Jean Claude Bidogeza demonstrated how traditional African vegetable seed production can be a profitable business.

A SWOT (Strength-Weakness-Opportunity-Threat) analysis for community-based vegetable seed production revealed availability of improved seed varieties from AVRDC, qualified trained human resources, good engaged producers’ organizations and land as strengths; good policy engagement and seed regulation, favorable land law and high demand were noted as opportunities. Weaknesses included illiteracy, resistance to change and to adopt new technologies, and insufficient financial and material support. Water supply was identified as a potential threat.

At the end of the training, participants were equipped with up-to-date knowledge and enhanced skills to produce and market quality seed of traditional African vegetables to increase their productivity and incomes, and provide a steady supply of nutritious vegetables to local markets.
FAREWELL TO GOOD FRIENDS: On 12 June 2015 Ambassador Dr. Ishaya S. Majanbu, Nigeria High Commissioner to Tanzania, (center) and Salisu Umara (left) of the Nigeria High Commission, Dar es Salaam, visited AVRDC Eastern and Southern Africa and Regional Director Thomas Dubois. Ambassador Majanbu will be leaving his post after 7 years in the position. He commended AVRDC for all the good work the Center has done, directly and indirectly, for his country.

PLACE YOUR ORDER: AVRDC – The World Vegetable Center invited seed companies and public agencies to participate in a training program for VegOneX Module 1, an online system for ordering foundation seed. The program was held at AVRDC Eastern and Southern Africa in Arusha, Tanzania from 26-27 May 2015. Five seed companies—East Africa Seed Company, Beula Seed Company, SubaAgro Seed Company, Krishna Seed Company, and Alpha Seed Company—sent staff to the course, and representatives from the Tanzania Official Seed Certification Institute (TOSCI) and Agricultural Seed Agency (ASA) also participated in the training program. The course offered instruction on how to use VegOneX to place orders for foundation seed, which will be filled by TOSCI.

DAS FEUER IN DER KÜCHE: Capsicum has been selected as "Vegetable of the Year" in Germany! Thanks to Johannes Timaeus for alerting us to Das Feuer in der Küche: Chili und Paprika sind Gemüse des Jahres 2015/16 (The fire in the kitchen: chilies and peppers are vegetables of the year 2015/16).

Read more at http://www.nutzpflanzenvielfalt.de/das-feuer-der-k%C3%BCche-chili-und-paprika-sind-gem%C3%BCse-des-jahres-201516