

# ASIAN SEED

THE OFFICIAL PUBLICATION OF THE ASIA & PACIFIC SEED ASSOCIATION



## **A New Look Asian Seed Magazine**

New design launched for APSA's 20th anniversary



## **Seeds – Banking on the Future**

In-depth reports on how seed banks are saving for the future



## **World Seed Congress 2014**

All eyes are on China at this year's ISF event in Beijing



## **Seed for Thought**

How the seed business has developed in the Asia-Pacific region

VOL.20 NO.2  
MAR/APR 14  
[apsaseed.org](http://apsaseed.org)



**BANKING ON SEEDS/  
NEW MAGAZINE DESIGN**





# The AVRDC Genebank, Taiwan

By Andreas W. Ebert, Global Theme Leader,  
AVRDC Germplasm & Genebank Manager

To develop improved vegetable varieties that yield well, resist pests and diseases, thrive under extreme heat or drought or flooding — and meet the specific preferences of farmers and consumers—plant breeders need access to a diversity of genetic resources. The AVRDC Genebank has met this need since 1971 with an ever-expanding, carefully documented collection of vegetable germplasm.

Diversity in the vegetable crop portfolio at local, national and global levels has powerful implications for food, nutritional and economic security as well as sustainable production. Individual and community nutrition improves when diets are rich in fruit and vegetables, which supply micronutrients essential for good health; with better nutrition at an early age, children can develop into healthy, productive adults. As the global climate shifts, improved vegetable varieties capable of thriving under harsh weather conditions will be sought to feed a growing population.

All of these benefits depend on access to genetic diversity of crops and their wild relatives for breeding programmes. Vegetable breeders scan available germplasm diversity for traits of interest as they strive to stay one step ahead of evolving pests and diseases, search for new heat-tolerant varieties, or develop crops for consumer market niches. Each year the Center's Genetic Resources and Seed Unit distributes 6,000 to 9,000 accessions and improved breeding lines for crop improvement programs and related research. The seed samples go to national agricultural research and extension systems (36%), private seed sector companies (21%), universities (21%), AVRDC scientists (14%), other genebanks (6%) and non-governmental organisations (2%).\*

Since it was founded, the AVRDC Genebank has distributed more than 624,000 seed samples (289,266 accessions/breeding lines) to researchers and breeders in 197 countries. More than 500 improved vegetable varieties developed from this germplasm have been released to farmers around the world, helping them to produce good harvests and generate income despite pest and disease pressure or abiotic stress.

\*2013 data

## You say tomato

Consider just one crop – tomato – to illustrate the impact and relevance of the vegetable germplasm held at the Center in the development of improved varieties:

- Bacterial wilt (BW) resistance in cultivated tomato caused by *Ralstonia solanacearum* originated from the wild tomato species *Solanum pimpinellifolium* and *S. lycopersicum* var. *cerasiforme*. The Center's tomato breeders intercrossed different BW-resistant sources with high general combining ability, such as VI043613 ('Hawaii 7997') followed by selfing and resistance screening in segregating populations to obtain progeny with superior BW resistance. High levels of resistance to late blight caused by *Phytophthora infestans* were found in *S. pimpinellifolium* and *S. habrochaites* accessions, and the Center has released late blight resistant lines carrying the Ph3 gene introgressed from *S. pimpinellifolium* accession VI009104 (L3708). The improved lines also are resistant against tomato mosaic virus, Fusarium wilt races one and two, grey leaf spot, and bacterial wilt. The wild species *S. pimpinellifolium* and *S. pennellii* are used in the Center's breeding activities to introgress heat and drought tolerance genes into cultivated tomato.

Seed companies greatly benefit from access to the AVRDC Genebank and the Center actively collaborates with the private sector, whose strength in commercial seed multiplication and marketing can rapidly spread AVRDC's beneficial research outcomes to farmers. Companies can obtain the Center's breeding lines to use as parent lines or as a source of traits in backcrossing programmes. AVRDC Genebank accessions are global public goods and as such are widely shared.



## Keeping the books

Smooth management of the genebank demands meticulous recordkeeping. The AVRDC Vegetable Genetic Resources Information System (AVGRIS) operated by the Center's Genetic Resources and Seed Unit facilitates the recording, storage and maintenance of germplasm data. It links all operations associated with germplasm conservation and management, from registration, characterisation, evaluation, seed inventory, and seed distribution to end-users.

The AVGRIS website (<http://203.64.245.173/avgris/>) provides direct access for users, who can search the database for details about accessions of interest. It contains three main types of data: passport, characterisation, and evaluation. Passport data includes the scientific name, cultivar or common name, subtaxa, origin, donor and registration date of each accession. Characterisation data describes a plant's morphological and agronomic characteristics, both at vegetative and reproductive stages. Evaluation data includes 20 different criteria of nutritive value, such as vitamin levels and percentage of antioxidants, as well as 13 criteria of resistance to pests and diseases, from powdery mildew to the bruchid beetle.

Plant breeders and researchers turn to the AVRDC Genebank to obtain the germplasm they need to breed productive, resilient, and nutritious vegetable varieties for farmers. The genebank is thus the first and the most essential link in the vegetable value chain that leads to improved health and incomes in developing countries. 🍅

*The opinions represented in the articles on seed banks are those of the authors.*



## Other notable seed banks

There are many seed banks and germplasm collections, here is a sample of some of them:

**United States Department of Agriculture Research Service (USDA)** supervises the operations of the National Center for Genetic Resources Preservation, located on the campus of Colorado State University in Fort Collins, Colorado, which has the world's largest collection of seed samples. It conserves the genetic resources of crops and animals important to US agriculture and landscapes. *Contact: [www.ars-grin.gov/ncgrp/center](http://www.ars-grin.gov/ncgrp/center).*

**Vavilov Institute of Plant Industry**, is a genetic research institute set up originally by legendary plant collector Nikolai Vavilov, located in St. Petersburg. The institute's seed survived the Siege of Leningrad in WWII; the Pavlovsk Experimental Station has the largest collection of European fruit and berries in the world but has been under threat from a luxury housing project. *Contact: [www.vir.nw.ru](http://www.vir.nw.ru).*

**Brazilian Agricultural Research Corporation (Embrapa)**, holds more than 102,000 seed samples in its collection, mainly on agricultural crops. *Contact: [www.embrapa.br](http://www.embrapa.br).*

**The National Institute of Agrobiological Sciences (NIAS)** in Japan is the central coordinating agency in Japan for the conservation of plants, microorganisms, animals and DNA materials related to agriculture. It has a network of institutes throughout Japan. NIAS Genebank information at: [www.dna.affrc.go.jp](http://www.dna.affrc.go.jp) or on NIAS at [www.nias.affrc.go.jp](http://www.nias.affrc.go.jp).



Photos by: Chen Ming-che