Global Action Plan for Agricultural Diversification

**GAPAD launches discussions on how to diversify crop production in a warmer world in response to the UN Sustainable Development Agenda**

Over 7 billion people currently depend on just four major crops to supply more than three-quarters of their food. By 2050, the global population is set to reach 9 billion. Temperature increases already are affecting production of the food supply. In a hotter world, options for agricultural diversification are needed that include a wider range of crops and cropping systems.

The Global Action Plan for Agricultural Diversification (GAPAD) is an initiative to support the Sustainable Development Agenda (Agenda 2030) adopted by the United Nations in September 2015. It responds to the Declaration on Agriculture Diversification, signed by world leaders during the United Nations Framework Convention on Climate Change (UNFCCC COP 21) in Paris in December 2015.

WorldVeg Eastern and Southern Africa Regional Director Thomas Dubois at GAPAD. Expanding market opportunities through processing and seed production will drive progress in Africa’s horticulture sector, he said. But farmers will be reluctant to grow more and different crops without sustainable solutions to pest problems such as *Tuta absoluta.*

(...continued on page 2)
The Nairobi roundtable

About 40 participants from 14 countries and five continents, all of whom were distinguished experts and leaders in fields relevant to agricultural diversification, took part in a roundtable forum held in Nairobi on 25 - 26 October 2016. They included high-level representatives of the African Union Commission (AUC), the SDG Centre for Africa, and the Australian High Commission together with representatives from research and development organizations and journalists. The aim was to start to develop a global action plan for agricultural diversification to contribute to achieving Sustainable Development Goal (SDG) 2 — zero hunger.

After a formal opening by H.E. Rhoda Peace Tumusiime, AUC Commissioner for Rural Economy and Agriculture, and brief scene-setting presentations and discussions, the participants quickly got down to work. The first step was to unpack the five main targets (2.1-2.5) and three additional targets (2a-c) that make up SDG2 (end hunger, achieve food security and improve nutrition, and promote sustainable agriculture). Participants developed working definitions of key words and phrases to enhance their understanding. They then identified and discussed some of the challenges that lay ahead in trying to meet the targets.

On the second day, participants developed GAPAD targets based on each of the eight SDG2 targets, using agricultural diversification as the focus. They identified several priority activities needed to achieve the targets, and determined when each activity could be completed and who might take the lead.

During the closing session, the roundtable participants agreed that the time was right to make an urgent start on the complex and ambitious process of agricultural diversification to meet the needs of a warmer world. It was noted that the participation of the AU Commissioner throughout the two days of the roundtable was a very clear demonstration of the seriousness with which the AUC is taking GAPAD and the implementation of Agenda 2030.

Going forward

The next step will involve a small group of highly qualified individuals who will distill and refine the output of the Nairobi roundtable and integrate it with outputs from roundtables for the other five SDGs being addressed by GAPAD. The result is expected to be a compelling, credible, inclusive, authoritative and investable global plan for agricultural diversification that has the support of all relevant institutions. It is anticipated that GAPAD will be formally launched and the plan for agricultural diversification submitted to the UN secretariat in mid-2017. In the meantime, GAPAD will build a network of experts, stakeholders, institutions, governments, and regional and international organizations to support and champion this urgent and important initiative.

GAPAD is spearheaded by Crops For the Future and supported by the Association of International Research and Development Centers for Agriculture (AIRCA). The Nairobi roundtable was organized by CABI and the World Vegetable Center.

Know your goals

The GAPAD initiative directly addresses six of the 17 Sustainable Development Goals (SDGs):

- #2 zero hunger
- #7 affordable and clean energy
- #12 responsible consumption and production
- #13 climate action
- #15 life on land
- #17 partnerships for the goals

Agricultural diversification will eventually contribute to achieving:

- #1 no poverty
Realizing the dream

Tony Agostino, consultant for modernizing the World Vegetable Center’s headquarters 40-year-old research infrastructure, encouraged staff to be bold and expansive in their thinking as the Center embarks on an initiative to remodel and redefine its working space.

“Look at the whole organization,” Agostino said, in a seminar at HQ on 22 November 2016. “What makes it healthy?” The physical spaces in which people work affect their perspective and output, so it is important to think through the purpose and value of each structure and how it contributes to the whole.

To help the Center plan for a facility to support world-class research, Agostino took a three-part view: 
- **consolidate** (maximize resource use for greater efficiency);
- **modernize** (build the structures and workflows to support new technologies, geno/phenotyping, and big data); and
- **integrate** (promote multidisciplinary staff interaction and idea sharing).

Open-plan labs will increase contact and collaboration among staff from different fields—and be more appealing to young researchers, who function in more social, connected spheres. Shared instrument rooms can foster more efficient use of equipment and maximize the Center’s investment in new technologies. Shared supply rooms for lab chemicals will allow for safer handling and tracking. Glasshouses and other working areas need to be consolidated and connected.

“Don’t be afraid of the bulldozer!” he said, in reference to demolishing old buildings that have outlived their usefulness. “If they can’t be retrofitted, old structures can become a liability—they use too much energy, may not be sufficient to support current and future research, and above all, may not meet current standards for safety.”

Agostino also mentioned the need for a “front door”—an attractive, engaging and compelling interpretation pavilion/demonstration garden space to visually anchor the campus and let all who enter feel the excitement of scientific discovery in horticulture.

He suggested developing a master plan that follows a phased, modular approach to the reconstruction, mapping out what we can accomplish in the short-term (1-2 years, focusing on the most urgent needs), medium-term (3-9 years); and long-term (10 years+). This master plan tied to the Center’s vision can be shared with current and potential donors to solicit their support.

“We are seeking nothing less than transformational change,” Director General Marco Wopereis said to the group. “So dream big and think big! What do we aspire to? Let’s create excitement around our work.”
WORLDVEG THEN & NOW: Current and former WorldVeg staff crossed paths at the International Symposia on Tropical and Temperate Horticulture, 20-25 November 2016 in Cairns, Australia. (left to right) John Macharia, VINESA Project Manager; Andreas Gramzow, Agribusiness/Marketing Specialist; Takemore Chagomoka, Production & Postharvest Specialist USAID Mali Scaling Project; Ellen Iramu, Project Coordinator – Pacific Islands; Simone Kathrin Kriesemer, former socioeconomics postdoc; Dyno Keatinge, former WorldVeg Director General; Stuart Brown, Project Manager, USAID Home Gardens Scaling Cambodia.

WORK IN PROGRESS: The new WorldVeg building in Bamako, Mali is nearing completion! The West and Central Africa team is looking forward to moving into their new offices soon; they'll have more space to carry out their work and meet with partners.

COLORS TO HONOR THE KING: The World Vegetable Center, in collaboration with the Tropical Vegetable Research Center at Kasetsart University, Thailand, will provide 250 seed kits and books to local farmers in remembrance of the late H.M. King Bhumibol Adulyadej. The kits will contribute towards his majesty's "New Theory in Agriculture" by providing high-quality vegetable seeds to create self-reliant farmers. Each kit contains 9 species of 7 different colors (with 7 unique nutrient profiles) to produce a beautiful, health-promoting garden, as well as a book on how to save the seed of each species.

Blue vegetables, such as the flower of butterfly pea, contain anthocyanins and other flavonoids providing the beautiful colors and protecting our body from oxidative damage and reducing the risk of heart disease.
Seminars

**P.G. Chengappa**, National Professor of Agribusiness and Marketing at the Indian Council of Agricultural Research, spoke to headquarters staff on 9 November 2016 about his experiences linking vegetable growers to markets in India. Developing direct farm-to-firm (supermarket, retailer or processor) links is essential for efficient operation of a vegetable value chain, and allows farmers to engage in marketing that addresses consumer demand.

**Tessie Boncato**, Visiting Scientist from Tarlac Agricultural University in the Philippines, spent a week at Center headquarters to meet with staff, pick up some tips on cucurbit grafting, and discuss opportunities for collaboration. Dr. Boncato gave a seminar during her stay on “Commercialization of off-season tomato production technologies” on 24 November 2016. She has been a strong promoter of tomato grafting in the Philippines, and has been instrumental in developing small-scale processing methods and products to ensure tomato farmers can find new markets for their crop.

On 28 November 2016, **Stefan Schwarz** from Phenospex, a company that makes plant phenotyping tools for industry and science, introduced a sensor-driven phenotyping system to Center researchers. The sensor can be integrated easily into screening routines, used under diverse environmental conditions, and delivers morphological information quickly and efficiently.

Representatives of the Beans with Benefits project—**Bakhodir Kuziyev** (Site Coordinator, Uzbekistan), **Shernabi Khan** (Site Coordinator, Pakistan), and Genebank Manager **Svein Solberg**—gave an update on their activities to headquarters colleagues on 1 December 2016. The project aims to integrate improved mungbean as a catch crop in the dryland areas of South and Central Asia to increase smallholder incomes and enhance the sustainability of regional production systems.

Visitors

A delegation of six visitors led by **Tong-long Wu**, Councilor of Tainan City Government, stopped by HQ on 30 November 2016 to learn about the Center’s research activities and facilities.
Onion farmers in Odisha, India previously indicated their interest to adopt good cultivation practices to harvest higher quality produce and realize good returns from their crop. The World Vegetable Center, through its project “Onion Value Chain Improvements in Odisha State,” invited about 50 farmers from Sanahinsar village, Angul district to participate in a one-day training course on improved production technologies on 19 November 2016. The course was organized by WorldVeg South Asia Training Coordinator PVL Bharathi, Visiting Scientist Arshad Ahmad Pal, Scientific Officer Swarna Sarika, and Research Technicians Tapan Kumar Pattanaik and Bipin Bihari Pradhan.

Prof. Pradyumna Tripathi from Odisha University of Agricultural Technology (OUAT) explained how onion seed can be sown on raised beds and seedlings can be grown in rows. He discussed suitable soil types for onion, and offered recommendations for irrigation and fertilizer application. He also used images to show the major pest and disease problems and talked about different methods of integrated pest management. The discussion was augmented by an Access Agriculture video that showed all the important steps in onion cultivation, starting from land preparation. While the video played, Swarna Sarika gave a running translation in the local language, Odiya.

At a demonstration plot in a farmer's field, the participants made a raised bed, sowed the seed in rows, covered the bed with paddy straw and watered it.

Although the farmers were interested in the row-sowing method, some felt the practice was too time-consuming, required more labor, and was difficult to do in heavy clay soils. Prof. Tripathi recognized their concerns and discussed solutions.

**WATCH**

Access Agriculture Videos  
http://www.accessagriculture.org/
The United Nations Food and Agriculture Organization (FAO) organized a regional training workshop on international sanitary and phytosanitary measures and emerging pest threats (*Tuta absoluta*, Asian Fruit Fly, Panama Disease, Banana Bunchy Top Virus and Maize Lethal Necrotic Disease) at the Naura Spring Hotel in Arusha, Tanzania from 23 October to 2 November 2016 for participants from the 15 countries in the Southern African Development Community (SADC). A field visit to the World Vegetable Center Eastern and Southern Africa office brought participants close to action where research meets practice.

To provide some background prior to the field visit, Thomas Dubois, WorldVeg Regional Director, gave a presentation on the history and management of *T. absoluta* in Tanzania. The group of 40 participants then visited WorldVeg on 28 October 2016 to learn about *T. absoluta* management strategies. In an effort to control this destructive pest, WorldVeg is conducting laboratory, screenhouse and field trials using biopesticides supplied by Real IPM Company, pheromone traps from Russell IPM, and a net house from the A-Z Company.

In the lab, Research Assistant in Entomology Never Mwambela explained and demonstrated rearing of *T. absoluta* colonies. Visitors observed and distinguished different developmental stages of *T. absoluta*, and were able to see and touch eggs, larvae, pupae and adult *T. absoluta*.

Participants were then introduced to the laboratory procedures for conducting larval, pupal and adult *T. absoluta* bioassays using biopesticides (*Metarhizium anisopliae*, *Trichordema asperellum*, *Bacillus subtilis* and *Beauveria bassiana*).

After the lab demonstration, participants toured the screenhouse to see the effect of endophytic biopesticides on the pest. Never showed how assays are conducted to determine if a tomato accession is resistant to the pest, and visitors were able to see how different tomato accessions and their trichomes (plant hairs) attract or repel *Tuta*.

In the field, participants saw the damage and loss *T. absoluta* causes by mining into leaves and fruit. Currently, WorldVeg has three field trials to test the efficacy of biopesticides, pheromone traps, and net houses for *T. absoluta* control. Participants were able to observe and count the number of moths per trap. They also compared the performance of a net house with open field plots for controlling insect pests, including *T. absoluta*; all could clearly see that growth parameters such as plant height and width were better under netting. The group then toured the Seed Repository, Postharvest Training and Services Center, and the Demonstration Garden, and concluded the visit with a discussion to formulate action plans, moderated by Dr. Dubois.
On 7 November 2016, the Sustainable Food Lab, a think tank of leaders for sustainable agricultural production in the mainstream food system, embarked on a “learning journey” to the World Vegetable Center Eastern and Southern Africa campus in Arusha, Tanzania. Participants came from the private sector, development organizations and government.

“Tanzania is a place where we can learn about the critical trends shaping agriculture in east Africa—from rapid urbanization to the impact of climate change,” one of the visitors said. “This is a very important agricultural production region in an area with one of the fastest growing populations in the world, and that’s why moving towards sustainable agriculture is critical.”

Ralph Roothaert, Project Manager for the WorldVeg Homegarden Scaling initiative in Kenya, Tanzania and Uganda, took the visitors on a tour to the Seed Repository, entomology lab, screenhouses for plant breeding, the Postharvest Training and Services Center, the demonstration garden, and the best practice hub for young farmer entrepreneurs participating in the VINESA project.

The visitors learned that the Center is increasingly outsourcing the production of seed kits for home gardens through local seed companies in Kenya, Tanzania, and Uganda. “Although our seed repository has the largest and most diverse collection of vegetable accessions in the region, we need to work closely together with seed companies,” Dr. Roothaert said. “These companies can produce small seed packets for farmers more efficiently and at less cost, because that’s their core business.”

In the laboratory, Elias Shem explained the Center’s research on tomato plant resistance to *Tuta absoluta*, a pest originating from South America that in the past has decimated tomato yields in Tanzania and the wider region, and is threatening to do so again. “This little moth has an extremely short life cycle,” he explained. “Every three weeks your *Tuta* population can multiply 260 times if you do nothing.”

LEARN MORE

*Sustainable Food Lab*
http://www.sustainablefoodlab.org/

WATCH

*The trouble with Tuta*
http://avrdc.org/the-trouble-with-tuta/
Lilian Nabangi from Bungoma County in Kenya is married with three children. She had a problem: her children didn’t like the food she cooked, and sometimes refused to eat. As a result her children were often ill; she took them to the clinic every two months in search of a cure.

Lilian went to secondary school, but dropped out at form 3, a year before the final exam. Her parents couldn’t afford the registration fee for the exams. She is very bright and charismatic; apart from her mother tongue Kiluhya, she speaks fluent English, Kiswahili and Luo. People in the village area aware of her leadership skills, and have elected her as the secretary of two different women’s groups. Six months ago she went to the local government office because she was in need of fertilizer for her farm.

Entrepreneurial as she is, she also inquired about any new initiatives the authorities were planning for her village. When she heard about the Homegarden Scaling Project of the World Vegetable Center, she convinced the government to come and work with her groups.

Project partner Farm Concern International also recognized her leadership potential and trained her to train other farmers, along with staff from Jomo Kenyatta University of Agriculture and Technology (JKUAT). Lilian learned about the use of improved varieties of traditional African vegetables, their nutritive value and taste, planting methods, cultivation techniques, thinning, harvesting, storage and cooking. She also learned how to establish a demonstration plot and how to teach other farmers improved agronomic practices.

Her demonstration plot is one of the best in the county, displaying impressive crops of slender leaf, nightshade, cowpea, spider plant and kale. She cleverly positioned it near a busy road to attract curious passersby, who, when they ask her, also receive an abbreviated training session on the advantages of traditional vegetables and how to grow them.

“They are sweet and don’t have the bitterness of the local varieties. “My children love it,” Lilian said with delight. “And I don’t need to take them to the doctor anymore.”

Apart from the demonstration plot she manages, she has established her own vegetable home garden using the same improved varieties and techniques. She harvests a lot of vegetables and can cook a different type of vegetable every day. She even has enough to sell some to customers and with the money she earns she buys small things like soap and sugar.

“These vegetables have helped our community and our immune systems,” she said. “The prices of different vegetables in the market are very high for small bundles, and they go up every day.” She is planning to increase her plot to half an acre, to ensure plenty of vegetables for home consumption and to increase her income.
Young people in Mali prepare to launch new horticulture-based businesses

Following the successful signing of a Memorandum of Understanding (MOU) between the World Vegetable Center and the Mali Agribusiness Incubation Hub (MAIH) in October 2016, fourteen young hub graduates visited the WorldVeg West and Central Africa office in Bamako on 2 November 2016 to learn more about the Center’s work and to explore opportunities for vegetable production and marketing. Cheik Diarra, Chief Executive Officer of MAIH and Salmome Coulibaly, Executive Assistant of MAIH, accompanied the group. The team from MAIH was warmly welcomed by WorldVeg staff members Takemore Chagomoka, Jean Baptiste De La Salle Tignegre, Moussa Kanoute, and Raki Diallo.

MAIH aims to stimulate agricultural development, nurture agribusiness enterprises, and foster sustainable business growth. It addresses the needs of entrepreneurs and farmers—youth and women in particular—through incubation services, training and networking, and by integrating science and technology for job and wealth creation.

Small-scale farmers are responsible for 80 to 90 percent of food production in Africa. With training and practice, young people like these Mali Agribusiness Incubation Hub graduates can create profitable careers in horticulture. For their first business endeavor, the group will begin producing seed of onion, tomato, hot pepper and African eggplant on a one-hectare plot in Bamako.

In the discussion that followed, the young visitors expressed interest in producing vegetables as a source of income to diversify their small businesses.

Through MAIH, WorldVeg has contracted with the group to produce seed of onion, tomato, hot pepper and African eggplant on a one-hectare plot. Group members will be trained in vegetable production and marketing at WorldVeg in December. “We’re excited to contribute to the development of viable horticulture-based business models for young people in Mali,” said Takemore Chagomoka, WorldVeg Production and Postharvest Specialist.

Cheik Diarra is pleased WorldVeg and MAIH are working together to benefit youth, especially around the city of Bamako. “Mali imports a large portion of vegetables to feed its population,” he said. “With many young graduates unemployed, we believe that collaboration with World Vegetable Center will help to develop exciting income-generating activities for youth. Through our agribusiness incubation program, we hope to create small and medium-sized enterprises based on World Vegetable Center technologies, among others.”
Omar Diouf is the new Project Manager for the Mali Horticulture Scaling Project. Dr. Diouf, a Senegalese national, holds a PhD degree in plant physiology and agrotechnology from the University of Brussels, Belgium. He is a crop physiologist with more than 14 years of experience in drought adaptation and crop modeling. Most recently he was Regional Operations Manager of the Millennium Promise/ Millennium Development Goals Center for West and Central Africa located in Senegal, where he ensured projects received the scientific and technological support and guidance needed to achieve the MDGs at the community level. Omar will be based at the WorldVeg West and Central Africa office in Bamako, Mali. He begins his posting on 18 December 2016.

NTU WELCOMES BINDU: WorldVeg South Asia Plant Physiologist Hanumanth Rao Bindumadhava caught up with some former lab partners during his recent visit to headquarters for global strategy planning in November. Dr. Harshvardhan and Dr. Rajesh Koova, who worked with Bindu in the Department of Crop Physiology at the University of Agricultural Science in Bengaluru, India, are now postdocs at National Taiwan University (NTU) in Taipei. Prof. Chwan-Yang Hong in NTU’s Department of Agricultural Chemistry invited Bindu to present his work on legume physiology to university faculty and students. Bindu shared details on stress tolerance phenotyping assays for mungbean, how to select efficient donor sources for breeding, experiments on tomato and mungbean water use efficiency, and associated links with stomatal (transpiration) and mesophyll (carbon-fixation) characters in plants using novel stable isotope signatures. The NTU researchers are keen to pursue joint research projects, student exchanges and more with WorldVeg. To that end, Bindu has been invited to deliver a lecture during NTU’s research projects meeting in spring 2017.
# 35th International Vegetable Training Course

## PARTICIPANTS


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Horticulture in Tanzania highlighted the Center’s home garden initiatives in Africa in the story “Vegetable Homegardens in Tanzania: The obvious way to combat malnutrition and raise healthy children” by WorldVeg Project Manager Ralph Roothaert in the October 2016-January 2017 issue:

https://drive.google.com/file/d/0B-YpKmnnEgb2cm9aQVZmMUFXWW8/view

Former WorldVeg Director General Dyno Keatinge continues to take every opportunity to promote vegetable production. At the recent International Symposia for Tropical and Temperate Horticulture in Cairns, Australia, Dyno told Australian Broadcasting Rural reporter Charlie McKillop why growing vegetables, not rice, is key to ending hunger and poverty:

http://ab.co/2gG1kcj