ANNUAL WORKPLAN 2016

AVRDC
The World Vegetable Center

Annual Workplan 2016
AVRDC - The World Vegetable Center

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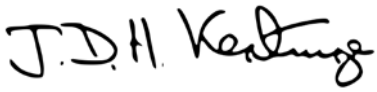
Foreword

The Sustainable Development Goals: Guiding the Center's efforts today and in the future

The research goals and activities covered in the *Annual Workplan 2016* represent AVRDC – The World Vegetable Center's ambitions based on core funding support, restricted project funding and resources from the Center's Innovations Fund to support research activities. While most of these activities already have been funded, some are awaiting financial support from donors, which the Center deems highly likely to materialize. However, unforeseen circumstances may affect the Center's funding sources.

AVRDC's global visibility will be increased by making adjustments to the Center's activities and communication strategy to align with the United Nations Sustainable Development Goals (SDG), particularly SDG 2 (*Zero Hunger:* End hunger, achieve food security and improved nutrition and promote sustainable agriculture). The Center may need to make internal adjustments to clarify its strategy for contributing to the attainment of the SDGs, not only SDG 2 but also other goals where AVRDC can have significant impact, such as SDG 12 (*Responsible Production and Consumption:* Ensure sustainable consumption and production patterns) and SDG 13 (*Climate Action:* Take urgent action to combat climate change and its impacts).

Implementation of changes suggested or recommended by the 8th External Program and Management Review began in mid-2015. The Annual Workplan 2016 allows sufficient flexibility to make adjustments to the Center's vision, goals, outputs and activities under the guidance of the new Director General, Dr. Marco Wopereis, who will begin his term in April 2016.



J.D.H. Keatinge
Director General

Office Map

1. **AVRDC - The World Vegetable Center Headquarters - Shanhua, Taiwan**
2. **East and Southeast Asia - Bangkok, Thailand**
3. Research and Training Station - Kamphaeng Saen, Thailand
4. Project Office - Hanoi, Vietnam
5. Project Office - Siem Reap, Cambodia
6. Project Office - Sigatoka, Fiji
7. Project Office - Honiara, Solomon Islands
8. **Korean Sub-Center - Jeonju, Republic of Korea**
9. **South Asia - Hyderabad, India**
10. Project Office - Ranchi, India
11. Project Office - Bhubaneswar, India
12. Project Office - Raichur, India
13. Project Office - Dhaka, Bangladesh
14. Project Office - Jessore, Bangladesh
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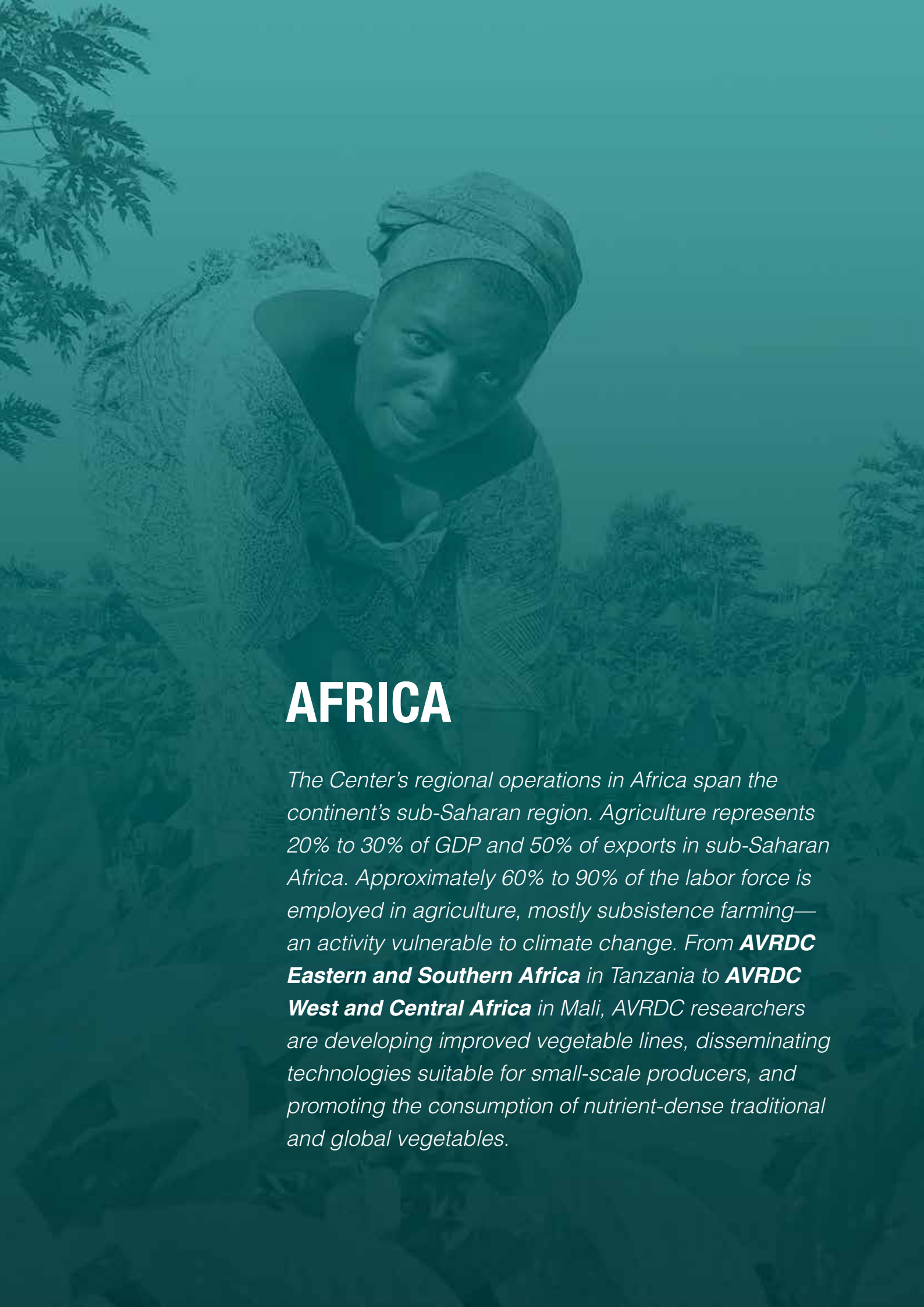
16. Project Office - Islamabad, Pakistan
17. Project Office - Sargodha, Pakistan
18. Project Office - Faisalabad, Pakistan
19. Project Office - Mingora-Swat, Pakistan
20. **Central Asia and the Caucasus Sub-Office - Tashkent, Uzbekistan**
21. Project Office - Dushanbe, Tajikistan
22. **Eastern and Southern Africa - Arusha, Tanzania**
23. Project Office - Kampala, Uganda
24. Project Office - Nairobi, Kenya
25. **West and Central Africa - Bamako, Mali**
26. Project Office - Sikasso, Mali
27. Project Office – Mopti, Mali
28. Liaison Office - Yaoundé, Cameroon
29. Project Office - Maroua, Cameroon
30. Project Office – Monrovia, Liberia



AFRICA

The Center's regional operations in Africa span the continent's sub-Saharan region. Agriculture represents 20% to 30% of GDP and 50% of exports in sub-Saharan Africa. Approximately 60% to 90% of the labor force is employed in agriculture, mostly subsistence farming—an activity vulnerable to climate change. From ***AVRDC Eastern and Southern Africa*** *in Tanzania to* ***AVRDC West and Central Africa*** *in Mali, AVRDC researchers are developing improved vegetable lines, disseminating technologies suitable for small-scale producers, and promoting the consumption of nutrient-dense traditional and global vegetables.*

EASTERN AND SOUTHERN AFRICA

About 340 million people live in the 22 countries that make up Eastern and Southern Africa, of whom 70% live in rural areas. The area encompasses several of the fastest growing economies in the world, including Tanzania, where the Center's regional office is located. Population densities and urbanization rates are very high in some countries, with a large proportion of youth. Women play an important role in vegetable production for home consumption and local trade, safeguarding the nutrition of their families, which is one of the main pillars of AVRDC's work in Africa. Traditional African vegetables are key in this pursuit, and will become more important with climate change. Vegetables are also increasingly chosen as income-generating agribusiness opportunities, a focus of the Center's activities in the region.

Business opportunities for youth: Peri-urban and urban agriculture offer great employment and income possibilities for urban populations—but, when cities are left unmanaged, pollution and environmental degradation make urban food production an unsustainable venture. Vegetable growing as a business is an interesting option for young people, who make up the majority of the population in many areas in Eastern and Southern Africa. The regional office will increasingly engage in projects and proposals specifically targeting peri-urban and urban producers and consumers. One such project is "Improving Income and Nutrition in Eastern and Southern Africa by Enhancing Vegetable-Based Farming and Food Systems in Peri-Urban Corridors" (VINESA), funded by the Australian Centre for International Agricultural Research. VINESA uses a value chain approach to train unemployed youth by linking them to best practice hubs for several months. For the last two years, VINESA has promoted employment, income and nutrition opportunities for smallholder farmers in Ethiopia, Malawi, Mozambique and Tanzania; to date, 185 young farmers have been equipped with skills such as identifying consumers' needs to become their preferred suppliers, reducing postharvest waste, and identifying and nurturing relationships with key value chain players. In 2016, in Malawi and Mozambique, VINESA partners will engage value chain players to target new markets using a seven-step guide based on a farmer SWOT (Strength-Weakness-Opportunity-Threat) analysis. Using quality declared seed (QDS) protocols, farmers in these countries will be equipped with skills to produce and market quality seeds and seedlings. In 2016, VINESA will continue to strengthen best practice hubs and find innovative ways to encourage graduated trainees to help scale out practices through peer-to-peer training. Project partners will develop exit strategies for the takeover of these hubs by returning graduates, communities, and other stakeholders. VINESA will publish a guide to "value chain thinking" and disseminate training videos for trainers to ensure the continuation of the best practice hub concept.

Nutrition for all: Women play an important role in vegetable production for home consumption and local trade, safeguarding nutrition of their families, one of the main pillars of AVRDC's work in the region. Traditional African vegetables are key in this pursuit and a focus of the regional office. The regional office houses a short-

term seed repository with more than 2,500 accessions, mostly of traditional African vegetables; this germplasm is made available to national research programs and the private sector. Climate change is a key driver altering vegetable production and consumption patterns in the region, and the importance of AVRDC's seed repository will increase as local landraces, especially of traditional African vegetables, often have higher resistance to and tolerance of biotic and abiotic stresses compared with more globally known vegetables. The seed repository will continue to grow, adding at least 100 accessions per year, and investments will be made in 2016 to turn the building into a cold room for long-term storage. With appropriate long-term storage, time intervals between seed regenerations can be increased. This will allow AVRDC researchers to focus more on evaluation of accessions using standard descriptors and to identify those with desirable traits, such as stress tolerance and resistance, for the benefit of public and private partners, and ultimately, smallholder farmers.

Seed supply: The seed repository at the regional office also supplies healthy seed kits throughout Africa, which are distributed to development, relief and community organizations in tandem with training-of-trainer programs. Systematic efforts to measure the impact of seed kits on improving nutrition were launched in 2015 and will continue, along with the search for suitable business models to transfer seed production know-how to the private sector in East Africa. In the regional United States Agency for International Development (USAID)-funded project "Deploying Vegetable Seed Kits to Tackle Malnutrition in Uganda, Kenya, Tanzania," home, school and community gardens are being established for enhanced access to, and consumption of, vegetables by poor households, especially women and children. A total of 18,000 seed kits will be distributed to farmers in 75 villages in the three countries to achieve this objective. Community gardens have been established in Tanzania and Uganda, and in 2016 AVRDC hopes to import the first lot of seeds into Kenya. Farmers from target villages in all three countries will be trained to train other farmers in seed treatment, nursery preparation, improved agronomic practices, postharvest technologies, food preparation and marketing. Demonstration gardens will be established in every target village, as they are an essential tool to help train seed kits recipients and demonstrate improved home gardens to indirect beneficiaries. Sustainable business models are being developed to produce and distribute seed kits through private seed companies in Kenya, Tanzania and Uganda. The impact of seed kits on nutrition may finally be answered, as the project is designed as a randomized control trial to draw a statistically sound conclusion. In 2016, a baseline study for the trial will be carried out in Kenya and Uganda, following the example of Tanzania. In all countries, local, regional and national campaigns will be launched to increase awareness about malnutrition of children and young women, and emphasize the importance of growing nutrient-dense vegetables in home gardens. Local cooking shows with locally accepted recipes will accompany these campaigns.

Breeding traditional vegetables: AVRDC hosts one of the few traditional African vegetable breeding programs in Africa and has the opportunity to take a leadership role in generating scientific information for this under-researched group of crops. At the regional office, selection and breeding efforts will continue to focus on traditional African vegetables, with amaranth (*Amaranthus* spp.; leafy types) and African eggplant (*Solanum aethiopicum;* fruit types) as the flagship crops. Through selection, parental lines are identified for use in breeding programs. The breeding program at the regional office will strengthen relationships with national agricultural research systems and seed companies to promote advanced lines for release and commercialization. Activities will increasingly focus on gender-disaggregated participatory cultivar selection to ensure developed cultivars fit not only to different

environmental conditions but also to the end user. While most efforts are geared toward selection within germplasm collections, creation of genetic variability started in 2015 and will continue in 2016 with selection within segregating populations for improvement of these two strategic crops. Amaranth, a crop grown in diverse agroecologies, is particularly interesting, and a strategic breeding question remains: Is it possible to develop amaranth cultivars that are broadly adapted to different agroecologies, or will be necessary to breed cultivars targeted for specific environments? Other traditional African vegetables are addressed through smaller projects, and selection of African nightshade (*S. scabrum*), Ethiopian mustard (*Brassica carinata*), spider plant (*Cleome gynandra*) and vegetable cowpea (*Vigna unguiculata*) is ongoing. Basic information required to improve the efficiency of breeding activities in traditional African vegetables is still lacking for most of these vegetables, and by strengthening collaborations with advanced research institutes, we hope to elucidate genetic factors determining high yield as well as high nutritional quality, and biotic and abiotic stress resistance or tolerance through molecular markers. Breeding research on global vegetables, especially tomato, a very important crop in Eastern and Southern Africa, will continue to be led by breeders at AVRDC headquarters.

A systems approach to vegetable production: Multiple cropping systems are an intrinsic component of agriculture in Eastern and Southern Africa. Vegetables in Eastern and Southern Africa are grown almost exclusively by smallholder farmers, along with other crops and commodities. Several projects at the regional office study vegetables using a systems approach. In the USAID-funded project "Africa Research in Sustainable Intensification for the Next Generation" (Africa RISING), led by the International Institute of Tropical Agriculture, farmer-managed field demonstrations are being implemented in four villages in Babati in Tanzania, a vegetable hotspot. The demonstrations contrast increased farmer resources and better technologies with controls, so that farmers can see the differences and learn from them, and scientists can measure the effect of the new technologies using cost-benefit analyses. In Africa RISING, AVRDC scientists are promoting mobile gardens and integration of vegetables with poultry. USAID recently started a sister project in Tanzania that fast-tracks delivery and scaling of agricultural technologies developed in Africa RISING. In 2015, AVRDC, in collaboration with the Horticulture Research and Training Institute - Tengeru, successfully implemented its first season training in nine pilot villages located across Tanzania. Nursery management, soil preparation and soil enhancement practices, good agronomic practices, postharvest handling, and food safety and preparation training sessions were conducted for 158 farmers, who subsequently became trainers themselves. Nine additional villages have been selected to scale out activities in 2016, and training activities will emphasize marketing.

Climate concerns: Climate change will increasingly dictate the direction of AVRDC's agronomy and integrated pest management research. Invasive species with high fertility and dispersal capabilities are rapidly adapting to changes in climate and are spreading in the region. One such pest is the South American leaf miner (*Tuta absoluta*). The Integrated Pest Management Laboratory at the regional office was refurbished and research on *T. absoluta* started in 2015. The incidence and extent of damage by this destructive moth on solanaceous crops and weeds in four major tomato growing regions of Tanzania is being assessed, and trials are underway to test the efficacy of commercially available pheromone lures and biopesticides. In 2016, AVRDC scientists will screen available tomato germplasm for resistance or tolerance. Grafting is another technology that holds great potential for Eastern and Southern Africa, as farmers can use the method to protect vegetable

crops against a range of soil-borne diseases. Effective grafting techniques for tomato, eggplant, chili, sweet pepper and several cucurbits developed by AVRDC in Southeast Asia will be tested and transferred to Eastern and Southern Africa.

Protecting the harvest: The regional office houses a large USAID-funded postharvest program and takes a three-pronged approach to tackle postharvest issues. First, through value chain analyses, problems and opportunities in vegetable postharvest are assessed. This is followed by adaptive research to identify new technologies and interventions, and provide solutions. Finally, improved technologies are promoted through awareness creation and capacity building, which will be a major focus for 2016 through development of training materials (e.g. videos) and implementing training and field days. Research on methods to reduce losses during transportation of tomatoes will continue with trials on improved tomato packaging designs. Storage remains a critical component for vegetables, and research will continue in collaboration with Jomo Kenyatta University of Agriculture on simple storage methods such as ice packs, insulated bags and hydrocoolers, as well as with Wakati, a Belgian entrepreneurial firm, on high humidity chambers. Processing of vegetables through drying and dehydration bypasses storage issues and offers opportunities for product diversification. Research into novel solar dryer designs, improving the nutritional quality of solar-dried vegetables, including moringa and vegetable cowpea, and better dehydration methods is ongoing in collaboration with the Nelson Mandela Institute of Science and Technology, the Amsterdam Initiative Against Malnutrition, and the Irish Aid-funded Good Seed Initiative.

Growing what will sell: Lack of access to input and output markers continues to stymie the best efforts of smallholder vegetable producers in Eastern and Southern Africa. Training activities often focus on improving smallholders' technical production skills, and do not emphasize business knowledge and marketing methods. In 2015, AVRDC Eastern and Southern Africa started to develop approaches to link smallholder farmer groups with each other, with markets, and with credit facilities. These approaches are the basis of current and future project proposals, and will continue to be the focus of agribusiness-related activities at the regional office for 2016. Together with the Tanzania Horticulture Association and Trias, AVRDC intends to set up a pilot vegetable marketing initiative in Arusha, Tanzania. Under the USAID Postharvest Project, a comparison of different vegetable marketing arrangements in Tanzania is being conducted, with the aim of developing guidelines for governments and donor organizations to improve vegetable marketing and postharvest processing initiatives.

Human capacity: AVRDC Eastern and Southern Africa employs 36 staff, of which 11 are internationally recruited scientists providing leadership in the region. The campus houses the International Institute of Tropical Agriculture, and is set to house other organizations and private companies starting in 2016 to create and enhance synergies. Apart from the regional office in Arusha, Tanzania, AVRDC has a two-year-old project office in Kampala, Uganda, and a new project office was opened in 2015 in Nairobi, Kenya. Other countries with research activities include Ethiopia, Malawi, Mozambique and, since late 2015, Zambia. As the regional office expands in 2016, activities will increase in scale and new regions will be reached. The regional office continues to build capacity through informal and formal training and in the immediate future, will strive to increase formal training for students.

WEST AND CENTRAL AFRICA

West and Central Africa is home to about 300 million people, many of whom are smallholder farmers growing a variety of staple food crops within complex farming systems where livestock, tree crops, and vegetables exist in various spatial and temporal configurations. Rising food and nutritional insecurity threatens the livelihoods of millions of these people, as well as the region's social cohesion and stability. As a growing population demands more and higher quality foods, and as environmental problems such as soil degradation, water scarcity, biodiversity loss, and climate change become more acute, the need for innovative vegetable solutions to improve food and nutritional security cannot be overemphasized.

Vegetables dominate production during the cool dry season and are grown with field crops during the warm rainy season. They are mainly grown on small plots and traded by women as fresh produce or dried products that account for a significant share of the market sales of agricultural products in the region. There are many opportunities, interventions and technologies that can support vegetable production and consumption, thus contributing to nutritional security. In particular, capacity building and policy interventions are critical to ensure mechanisms are in place to support both the production and the market, thus contributing to availability of affordable and health-promoting vegetables.

Hub-and-spoke delivery of technologies and knowledge: The main thrust of the Center's work in West and Central Africa in 2016 will be in hub-based, community-immersed dissemination of best-bet technologies through a combination of training-of-trainers sessions in seasonal vegetable production and processing, behavior change communication in nutrition and WASH (water-sanitation-hygiene), and community-led total sanitation. For each production cycle (rainy and cold seasons) the training-of-trainers sessions will target lead farmers from the hosting communities and 3-5 satellite communities; each lead farmer will commit to train at least three other people from his/her community. The same model will be used for behavior change communication training, and the beneficiaries will be selected from the groups targeted for training-of-trainers interventions whenever possible. Community-led total sanitation activities will be implemented in the communities hosting or linked to the dissemination hubs.

The United States Agency for International Development (USAID)-funded "Deploying Improved Vegetable Technologies to Overcome Malnutrition and Poverty in Mali" is the largest project managed by the regional office. From 2016 onwards, the project will expand its geographic coverage beyond the Sikasso region to beneficiaries in

Mopti and Tombouctou regions, and will increase the intensity of interventions to improve the adaptive capacities of vulnerable communities and households. The expansion specifically aims to carry out the following interventions:

1) *Establish additional Vegetable Technology Immersion Clusters (VTICs) and supporting water access facilities in Mopti.* The project will take over 20 additional Feed the Future communes that initially were to be covered by the Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) project. In these communes, the project will construct or repair/upgrade wells and boreholes to increase water access. Implementation of activities in Mopti will follow the model already used in the region by AVRDC. Most of the targeted communes are not very far from AVRDC sites, which will facilitate deployment of technologies, practices, and activities.

2) *Develop a modest intervention in Tombouctou region.* This comes in the aftermath of the signing of the Peace Accord (a milestone which AVRDC, like USAID and other development partners of the Government of Mali, welcomes) and the hope that the actual situation on ground will quickly echo the intentions expressed in the accord. The deployment of activities in Tombouctou will closely align to the security situation on ground and as logistics permit. The interventions made by the project are intensive in nature and require time and repetition to be successfully assimilated and reproduced by beneficiaries. Constructing VTICs is time-consuming and costly, and the infrastructure cannot be removed and re-established elsewhere.

AVRDC recognizes that it does not have the capacity to deploy human resources to conflict areas nor operate successfully in such zones. Hence, the Center will carefully weigh and plan any intervention in Tombouctou in close consultation with local partners to ensure maximum impact in a short time. This will also apply to operations in northern Cameroon, where the International Fund for Agricultural Development (IFAD)-supported project "Enhancing productivity, competitiveness and marketing of onion in the Sudano-Sahelian region of Cameroon" is entering its fourth year of implementation. The hub-and-spoke outreach model will be used to establish the Center's presence in Liberia and consolidate operations in non-presence countries.

Research: The Center will continue to be involved in breeding, cropping systems, and post-production research, notably through the Africa RISING project in northern Ghana and southern Mali and the Urban Food Plus project in Cameroon. Onion breeding in Mali is supported through the internal Innovations Fund.

Evaluating performance: The region has implemented several projects involving downstream dissemination and adaptation of tested vegetable technologies. The next step is to undertake scientific evaluation of the performance of the technologies as well as the dissemination process. Critical project interventions will be assessed to generate new knowledge that could support future policy formulation on issues such as deployment of new varieties; pesticide use; barriers and incentives to adoption of new technologies and consumption of new/improved vegetables; and effectiveness of the mechanism used for testing, adapting and delivering research outcomes and building capacity to turn the research outcomes into profitable businesses as dictated by local conditions.

Targeting the right groups with the right interventions: Research and development practices in horticulture often cater to farmers with higher levels of

education and more resources to invest in good quality inputs—an approach that may be biased against smallholders, especially women. Promoting home gardens among women and disadvantaged groups to produce a diversity of nourishing fruits and vegetables year-round is equally as important as efforts that emphasize commercial monocropping and export markets. Projects in the region provide a mechanism to systematically engage women in organized platforms that connect them to improved technologies. However, there is little evidence that such an approach is effective in empowering women to gain control over horticultural production systems and in improving nutritional outcomes of women and children. The Center will carry out a pilot study in Mali using a newly developed indicator, the Women's Empowerment in Agriculture Index, to test if the current intervention strategy contributes to women empowerment, which is a precondition for gender equality. The developed method can be rolled out to other AVRDC projects with similar objectives.

Human capacity: The growing number of staff in West and Central Africa, particularly in Mali, and the need to expand research into more upstream areas has made it necessary to erect a new building with increased office and laboratory capacity, which will be completed in 2016.

ASIA

Asia accounts for more than 60% of the world's population. Its diversity of people, climates and crops is a challenge for research and development programs—yet it is also a strength, as what is learned in one location can be shared and adapted in others. Staff at AVRDC offices in ***East and Southeast Asia*** *in Thailand,* ***Oceania, South Asia*** *in India, and* ***Central Asia and the Caucasus*** *promote consumption of home garden-produced nutritious vegetables to address malnutrition, share improved lines and production technologies with farmers to increase their opportunities and incomes, and join with partners to stimulate market demand for vegetables and enhance the entire vegetable value chain.*

EAST AND SOUTHEAST ASIA OCEANIA

East and Southeast Asia and Oceania both require more nutritious vegetables but differ in terms of regional accessibility and diet-related health risks. Traditional foods in Oceania have been replaced with high-calorie diets that lack nutrients, leading to high rates of type 2 diabetes and other noncommunicable diseases. To mitigate this, nutrient-dense traditional vegetables will be promoted along with methods for seed multiplication and storage. Improved varieties of global and high value vegetables will be tested, selected, registered and made available to farmers. Activities in Oceania are undertaken in direct collaboration with the Secretariat of the Pacific Community (SPC) and national Departments of Agriculture to increase technical capacities. In East and Southeast Asia there is an inherently higher demand for vegetables, but the need remains to diversify diets with health-promoting vegetables. The use of inappropriate mixtures of pesticides throughout the region has led to food safety issues and associated health risks to the environment, growers and consumers, and to reduced opportunities for trade. To mitigate this, systems will be introduced for appropriate diagnostics, control interventions and extension.

Diversifying diets to improve health: Many people in the island nations of Oceania suffer from diet-related health problems. Rates of type 2 diabetes far exceed global standards—for example, Nauru has the highest proportion of diabetic people (33%) of any country in the world. Anemia, riboflavin deficiency, and calcium deficiencies are also common, while heart disease, hypertension and other chronic diseases are on the rise. This is due primarily to diets based on carbohydrate-rich staple crops and imported, highly refined foods that are low in fiber but high in fat and sugars. The dietary transition to more processed food has resulted in the underproduction and consumption of vegetables. This has been further exacerbated by population growth, urbanization, and the sale of vegetables to tourist hotels or for export. Increased production and consumption of nutritious vegetables and diversified diets offers an immediate opportunity to address these critical health issues and to achieve food and nutritional security. This is particularly true for isolated rural and poor urban communities where affordable, nutritious food is difficult to obtain.

Although traditional diets featured local micronutrient-rich vegetables such as greens of taro, yam, and slippery cabbage and also tomatoes, cucumbers and green beans, vegetable production and consumption has steadily waned in the Pacific nations. While there have been efforts to diversify food production through vegetable cultivation in Fiji, Kiribati, Solomon Islands, Mariana Islands, and Papua

New Guinea, these activities are often at a subsistence level, using poor quality seed and targeting only a few vegetable crops. To mitigate reliance on imported seed of varieties that are poorly adapted to the islands' environmental conditions and not suited to local market preferences, AVRDC will introduce improved varieties for selection and registration. Seed will be made available through implementation of seed saving techniques and multiplication schemes. AVRDC's base for Oceania operations in Fiji will spearhead key interventions to promote the benefit and cultivation of traditional vegetables and to strengthen research capacity for integrated crop management and commercialization of high value vegetables.

Safe vegetables open markets: The United Nations Industrial Development Organization (UNIDO) Regional Trade Standards Compliance Report (2013) recognized that countries in the Association of Southeast Asian Nations (ASEAN) had huge potential to gain from macro trends of increasing population and purchasing power by increasing vegetable sales, but that this was not being met in all countries; a significant constraint was food safety, with pesticide contamination the paramount concern. To mitigate pesticide misuse, farmers and extension workers will be provided with diagnostic capacity to identify the cause of disease. This is the first critical step toward deploying appropriate control interventions that include natural enemies, chemical attractants, agronomic methods and judicious pesticide use (correct product, dose, timing, application, storage and disposal). Biopesticides with the greatest control efficacy against the region's most troublesome pests and diseases will be tested and commercialized. Protected cultivation and grafting will be promoted to overcome diseases and also to facilitate production during adverse seasons and to mitigate climate change impacts while sustaining vibrant vegetable value webs.

Promotion of vegetable species and varieties with unique characteristics lies at the core of AVRDC's strategy. Regional testing will continue to reveal which materials are best suited to specific environments with resistance to biotic and abiotic stresses and with traits favored by consumers and markets. East and Southeast Asia has a rich biodiversity of nutrient-dense and hardy traditional vegetables; seed of these species are not distributed by private seed companies, so efforts will continue to promote their cultivation and multiplication through participatory training of farmers, communities, regulatory authorities and public and private seed suppliers. AVRDC's global cucurbit breeding program based in Thailand focuses on bitter gourd and pumpkin and will continue to develop disease-tolerant lines with desirable fruit shape and size, and to provide lines for regional testing and adoption. The cucurbit program continues to evolve and gain recognition from scientists, the public and private sector, and has received significant investment from a consortium of private seed companies eager to test and distribute the elite materials developed.

ASEAN's middle- to high-income countries require capacity to improve nutrition and food safety, while its low-income countries need support to establish sustainable vegetable cultivation. All countries require more resilient production and market systems that are sustained through protection of the environment and financially rewarding value webs. To achieve this, the capacity of research and development partners will be enhanced through AVRDC East and Southeast Asia's role as a training hub. Sustainable agricultural technologies developed by AVRDC and collaborating organizations will be disseminated through the three-month International Vegetable Training Course (IVTC). The academically and internationally recognized IVTC will be in its 35th year of operation in 2016 and facilitates the training needs of other AVRDC regions and headquarters. The IVTC attracts experienced resource persons from several leading international

universities, research and development organizations, and government agencies to complement past and present AVRDC experts. Training on postharvest technologies will be provided during two major international training workshops targeting experts selected by the Asian Food and Agriculture Cooperation Initiative and a delegation from the Nepalese Government. Regional training initiatives offer the opportunity to nurture alumni and technical networks.

AARNET activities: The ASEAN-AVRDC Regional Network for Vegetable Research and Development (AARNET) will hold its 2016 Annual Steering Committee Meeting in Malaysia, hosted by the Malaysian Agricultural Research and Development Institute (MARDI). This will be followed by the AARNET Expert Regional Consultation on *Vegetables for Health: The Essential Role of Vegetables in Supplying Micronutrients.* MARDI also is collaborating with AVRDC to host the biannual regional symposium SEAVEG 2016, a forum to promote research and development for vegetables; the focus of this year's event is *Vegetables for Improved Nutrition and Livelihoods in Southeast Asia.* AARNET meetings and the SEAVEG symposium offer the opportunity to promote AVRDC technologies, develop partnerships and communication platforms, and generate innovative research and development proposals.

AVRDC East and Southeast Asia is hosted by Kasetsart University, which offers opportunities for research collaboration and exposure of Kasetsart University scientists to international development projects. New opportunities are afforded in Myanmar, as AVRDC will complete the signing of a host country agreement with the government to strengthen capacity building efforts extended to the Department of Agriculture for genebank management and variety screening. AVRDC will promote Hazard Analysis Critical Control Point (HACCP) analysis in the region to ensure vegetable value webs are free from crop and human diseases and chemical contaminants.

The need is great and demand is rising: Vegetables confer a distinct advantage over staple crops as a bountiful supply of nutrients can be produced from even small plots of land. There are a variety of production systems in East and Southeast Asia and Oceania, from home and smallholder gardens to community, school and urban gardens to larger, more intensive, market-oriented operations. This variety in size and scope lends itself to local adaptation to satisfy grower and market demand with direct impacts on diet diversify and health, and these diverse practices will be vigorously tested across the region. Great opportunities exist to modernize vegetable production systems to become more efficient, sustainable, climate-smart, and safe for producers, consumers and the environment. There are significant opportunities for AVRDC in the region as a result of economic progress over the past three decades and the increasing need and demand for safe, nutritious, affordable and culturally appropriate vegetables. The Center will deploy its comparative advantage to develop technologies that improve vegetable-derived nutrition impact pathways by promoting global elite lines and traditional varieties suited to growing conditions, local environments and market preferences. Nutrients will be delivered to consumers through appropriate postharvest technologies and sustainable value webs with strong producer-market linkages.

SOUTH ASIA

AVRDC's work in the region is shaped by South Asia's huge needs, a planning vision developed over three years, and the opportunities that come through successful projects. South Asia has a population of 1.6 billion, accounting for 22% of the world's people. Serious malnutrition problems persist in certain locations and communities. The region is dominated by India, the world's second largest vegetable producer, but home to more malnourished people than all of sub-Saharan Africa combined. There is a great need for improved vegetable production and consumption across the entire region. While Bangladesh has made progress in reducing malnutrition, availability of vegetables in the country is still only about 20% of the minimum needed for the good health of its population. In Pakistan vegetable production is less than half of what is required. Nepal has some of the worst malnutrition rates in the world. Even Bhutan, which has a mild climate and a per capita income more than 30% higher than India, only produces about 60% of its own vegetable requirements.

A vision for the region: AVRDC – The World Vegetable Center is a small but strategic player in the region. By far the largest regional impact of AVRDC has been through its improved germplasm—particularly that of tomato and chili. Other historically important activities have been in developing and promoting integrated pest management (IPM) for vegetables and in professional training.

An updated vision for the region was developed during a one-day workshop on 25 April 2015 following the Board of Directors meeting in Hyderabad. Involving senior regional staff, theme leaders, all regional directors and the Deputy Director General - Research, it built on a similar regional planning workshop held two years earlier and identified the following regional priorities organized within the AVRDC research themes:

Germplasm

- Partner with regional institutions to work on traditional vegetables for tribal communities.
- Collect local germplasm and establish a regional core collection of indigenous vegetables.
- Develop a core regional collection of local landraces of globally important crops.

Breeding

- Expand multilocation varietal testing of globally important vegetables in 4-5 characterized sites.
- Work with the seed sector to address regional tospovirus problems.
- Introduce global germplasm to improve traditional vegetables.

Production

- Extend recent IPM achievements in cucurbits, summer tomato and eggplant.
- Develop and promote low cost protected cultivation for adaption to climate change.
- Exchange novel IPM technologies between regions to harness immediate benefits.

Consumption

- Complete postharvest loss baseline studies and provide training and policy advice.
- Assess opportunities for value adding and social research of food consumption patterns.
- Assess the effectiveness of changing practices in postharvest research and extension.

The region's research capacity will continue to improve following recent staff appointments, the completion of plant physiology and postharvest labs at the regional office, and the start of several new projects. A new four-year Australian Centre for International Agricultural Research (ACIAR)-funded project on mungbean starting in 2016 will link India, Bangladesh, Myanmar and Australia and has a strong research focus. Work funded by Indian state governments is also expanding with two new projects in Odisha, existing work in Karnataka, and work under development in Andhra Pradesh. Most of this is development-oriented, but there are also some novel research components. Further implementation of the regional vision will depend on obtaining suitable project funding; the appointment of a Regional Project Development Specialist to address this need is making a major difference to regional operations.

GERMPLASM: Germplasm conservation, evaluation and gene discovery

Goal: Biodiversity of vegetable genetic resources is preserved and its utilization for food and nutritional security is enhanced	**Purpose:** Vegetable germplasm collected, conserved and distributed; the collection characterized to identify accessions with desirable traits, and the genes underlying these traits made available for breeding
Output 1: Vegetable genetic resources including wild relatives and breeding materials collected, conserved and distributed **Outcome:** Vegetable genetic resources preserved and made available globally for crop improvement	
Activity 1.1 Collect, acquire and conserve vegetable germplasm	*Output Targets 2016* • 150 accessions collected/acquired at the Center's headquarters • 100 accessions/breeding lines collected/acquired from sub-Saharan Africa for safety duplication at the AVRDC Eastern and Southern Africa seed repository
Activity 1.2 Maintain effective regeneration and multiplication of priority vegetable germplasm	*Output Targets 2016* • 1,200 accessions regenerated at Center headquarters • 200 accessions regenerated at the AVRDC Eastern and Southern Africa seed repository • Good quality seeds of at least 10 vegetable crop species multiplied at the AVRDC Eastern and Southern Africa seed repository for nutritional seed kits and for multilocation and on-farm trials • Seeds of recommended eggplant (*Solanum melongena*), chili pepper (*Capsicum* spp.), tomato (*S. lycopersicum*) and fig-leaf gourd (*Cucurbita ficifolia*) rootstocks produced at Center headquarters for training and distribution
Activity 1.3 Distribute vegetable germplasm accessions and improved lines worldwide	*Output Targets 2016* • 90% of vegetable germplasm requests served • Seed samples of 3,500 accessions/breeding lines distributed worldwide from headquarters • Seed samples of 700 accessions/breeding lines distributed from the AVRDC Eastern and Southern Africa seed repository

Activity 1.4 Safety duplicate AVRDC – The World Vegetable Center germplasm in other genebanks	*Output Targets 2016* • 1,000 accessions from the Center's headquarters and from the AVRDC Eastern and Southern Africa seed repository duplicated at the National Agrobiodiversity Center, Korea and at the Svalbard Global Seed Vault, Norway • 100 accessions from the AVRDC Eastern and Southern Africa seed repository duplicated at the Center's headquarters • 450 vegetable germplasm accessions duplicated at the Taiwan National Plant Genetic Resources Center
Activity 1.5 Systematically store information on conservation and distribution of vegetable germplasm in AVRDC- The World Vegetable Center's electronic databases	*Output Targets 2016* • All acquisition and distribution data generated in 2015 entered into the Center's Vegetable Genetic Resources Information System (AVGRIS) • Characterization and evaluation data of the 2013/14 regeneration cycle made available in AVGRIS
Activity 1.6 Train human resources and ensure women's enrollment in vegetable genetic resources conservation, management, and evaluation using conventional and advanced techniques	*Output Targets 2016* • Training courses conducted for both men and women on germplasm conservation and management, and use of molecular tools for biodiversity analysis, germplasm evaluation and marker-assisted selection • A selection of vegetable accessions/lines, production technologies and nutritional information displayed in the demonstration garden at headquarters and in AVRDC's regional offices to disseminate information to at least 500 visitors, and shared through community education for men and women, and AVRDC's germplasm and technologies showcased in various events

Output 2: Vegetable germplasm characterized for a better understanding and broader use of the biodiversity preserved in the AVRDC – The World Vegetable Center genebank

Outcome: Knowledge about the genetic and trait diversity of vegetable germplasm guides collection and conservation efforts and is used to identify materials with favorable traits for vegetable breeding

Activity 2.1 Conduct morphological and molecular characterization of vegetable germplasm maintained at AVRDC headquarters and its Regional Centers	*Output Targets 2016* • 900 accessions at the Center's headquarters and 200 accessions at AVRDC Eastern and Southern Africa characterized, based on standard morphological descriptors • Characterization of 50 selected genebank accessions carried out in Central Asia and the Caucasus region • *Momordica* working collection characterized at the molecular and morphological level • Molecular and morphological characterization of an *Amaranthus* germplasm sample (50 genotypes) conducted • Molecular characterization of the tomato, pepper and eggplant collections initiated

Activity 2.2 Identify and characterize sources of resistance to viral diseases	*Output Targets 2016* • *Capsicum* germplasm screened for resistance to *Pepper mottle virus* • Cucurbit germplasm and breeding lines screened for resistance/tolerance to begomovirus and crinivirus • Leafy brassica germplasm screened for resistance/tolerance to potyvirus
Activity 2.3 Identify and characterize sources of resistance to fungal and bacterial diseases	*Output Targets 2016* • Resistance to anthracnose (*Colletotrichum* spp.) in chili pepper (*Capsicum baccatum* and *C. frutescens*) evaluated • Resistance to Fusarium wilt (*Fusarium oxysporium* f.sp. *tracheiphilum*) in yard-long bean (*Vigna unguiculata* subsp. *sesquipedalis*) evaluated • Resistance to bacterial wilt (*Ralstonia solanacearum*) in eggplant (*Solanum melongena*) evaluated
Activity 2.4 Identify and characterize sources of resistance to insect pests	*Output Targets 2016* • Tomato accessions *Solanum galapagense, S. cheesmaniae*, and *S. pimpinellifolium* screened against thrips, red spider mite (*Tetranychus evansi*) and South American tomato leafminer (*Tuta absoluta*) in East Africa • Mechanisms and bases of resistance to leaf webber (*Spoladea recurvalis*) and stem weevil (*Hypolixus* spp.) in amaranth accessions characterized
Activity 2.5 Identify and characterize sources of abiotic stress tolerance	*Output Targets 2016* • Mungbean (*Vigna radiata*) germplasm subset evaluated under salt and heat stress • Solanaceae germplasm accessions with tolerance to salt stress identified for use as potential rootstocks for tomato and sweet pepper cultivation • Variation of transpiration and water use efficiency among 30 tomato and mungbean germplasm accessions determined
Activity 2.6 Evaluate vegetable germplasm for selected nutrition-related compounds	*Output Targets 2016* • Nutrient data and lists of vegetables commonly consumed in Burkina Faso, Nepal, Bhutan, Tanzania, and Indonesia included in the web-based AVRDC nutrient database (http://www.avrdc-nudb.org) • Phytochemical data of selected fruit and vegetables generated and included in the AVRDC nutrient database • Anti-nutritional data of vegetables generated by AVRDC Nutrition Lab and/or from reports, and included in AVRDC nutrient database

Output 3: Populations and molecular tools developed to enhance access to breeder-desired traits for vegetable crop improvement

Outcome: Genes conferring superior horticultural traits and marker-assisted selection methods make development of improved vegetable cultivars more efficient

Activity 3.1 Develop specialized pre-breeding populations for trait capture and quantitative trait locus (QTL) mapping	*Output Targets 2016* • Founder lines for a multi-parent advanced generation intercross (MAGIC) population for *Amaranthus* defined • New mapping populations for locating quantitative trait loci (QTLs) for resistance to pepper anthracnose initiated • *S. galapagense* and *S. pimpinellifolium* F_2 populations developed to map whitefly (*Bemisia tabaci*) resistance • Crosses created to introgress whitefly resistance from *S. galapagense* and *S. pimpinellifolium* into cultivated tomato
Activity 3.2 Identify QTLs for resistance to biotic and abiotic stresses	*Output Targets 2016* • Late blight resistance genes in at least one mapping population derived from *S. habrochaites* mapped • Combined analysis of salt tolerance traits in bi-parental populations and in a germplasm sample of *S. pimpinellifolium* conducted to identify QTLs for salt tolerance • Salt and heat tolerance candidate QTLs identified in the mungbean mini-core collection
Activity 3.3 Make available validated molecular marker sets for marker-assisted selection of priority vegetable crops	*Output Targets 2016* • Molecular markers associated with bruchid (*Callosobruchus maculatus*) resistance in mungbean validated and forwarded to breeders • Markers for powdery mildew resistance in mungbean forwarded to breeders
Activity 3.4 Broaden the technology base for molecular breeding: Establish genome editing for priority vegetable species as an alternative for genetic engineering	*Output Target 2016* • Proof-of-concept to apply the CRISPR/Cas9 technology for knocking-out genes in AVRDC tomato lines achieved

BREEDING: Genetic enhancement and varietal development of vegetables

Goal: Varieties with potential to expand opportunities in tropical vegetable production

Purpose: Farmers obtain vegetable varieties that produce high yields of nutritious and marketable food with less risks to health and the environment

Output 1: Cultivars and lines of vegetables with improved disease resistance, stress tolerance, quality and nutritional traits developed

Outcome: Lines adopted directly as cultivars or used in public/private sector breeding programs

Activity 1.1 Develop heat-tolerant and disease-resistant tropical tomato (*Solanum lycopersicum* L.) with desirable horticultural and quality traits	*Output Targets 2016* • 2-3 fresh market tomato lines late blight (caused by *Phytophthora infestans*) resistant and tomato yellow leaf curl disease-resistant F_7 lines developed and evaluated for horticultural traits • 2-3 dual purpose (fresh market/processing fruit types) F_7 lines developed and evaluated for horticultural, fruit processing and nutrient content • 3-5 tomato yellow leaf curl disease-resistant fresh market cherry tomato hybrids targeted for the Taiwan market tested in replicated trials
Activity 1.2 Develop and distribute disease-resistant chili pepper (*Capsicum annuum*) cultivars, targeting anthracnose (caused by *Colletotrichum* spp.), Phytophthora blight (caused by *Phytophthora capsici*), bacterial wilt (caused by *Ralstonia solanacearum*), *Cucumber mosaic virus, Chili veinal mottle virus*, and/or begomoviruses, aphids (*Myzus persicae*) and mites (*Tetranychus urticae*)	*Output Targets 2016* • 150 F_6 RILs segregating for leaf curl disease and insect tolerance advanced to F_7 generation and seeds increased • At least 50 segregating populations screened for multiple disease reactions and advance for further selection • Seeds of 5-10 new hot pepper lines distributed to collaborators
Activity 1.3 Develop heat and disease tolerant tropical sweet pepper (*Capsicum annuum*) (targeting *Potato virus Y, Chili veinal mottle virus*, bacterial wilt and Phytophthora blight	*Output Target 2016* • 5-8 new sweet pepper inbred lines made available to collaborators and 3-4 lines combining heat tolerance and resistance to one or two diseases developed

Activity 1.4 Develop short-day red and yellow onions (*Allium cepa*) for improved yield and extended shelf-life	*Output Target 2016* • Bulk crosses developed for recombination of major horticultural traits (high yielding, high dry matter content, early maturity, storability and adaptation to humid season) of the best local purified selections from Mali local onion populations
Activity 1.5 Develop improved vegetable soybean *Glycine max* and mungbean *Vigna radiata* with improved stress tolerance and nutritional and flavor qualities	*Output Targets 2016* • Preliminary yield trials of 63 mungbean yellow mosaic disease-resistant lines and 132 powdery mildew disease-resistant mungbean lines conducted in India. • Evaluation of bruchid (*Callosobruchus maculatus*)-resistant mungbean lines conducted in Asia and sub-Saharan Africa. • Bruchid-resistant mungbean lines screened and advanced to F_6 at the National Agricultural Research Center (NARC), Pakistan • Crosses conducted to improve vegetable soybean seed viability using parental line GC-84501-32-1.
Activity 1.6 Develop cucumber (*Cucumis sativis*) lines for improved horticultural traits, disease resistance, good fruit quality, and high gynoecy	*Output Target 2016* • Advanced yield trial of selected Japanese type (a popular market type in Southeast Asia and Africa) cucumber conducted at AVRDC headquarters in Taiwan
Activity 1.7 Develop disease-resistant and high quality pumpkins (*C. moschata*)	*Output Targets 2016* • Advanced yield trial of two *Zucchini yellow mosaic virus*-resistant hybrids conducted at AVRDC in Taiwan • Screening of BC_4S_4 lines for multiple virus (*Zucchini mosaic virus, Cucumber mosaic virus, Papaya ringspot virus*) resistance completed
Activity 1.8 Develop bitter gourd (*Momordica charantia*) possessing improved yield, earliness, good fruit quality and resistance to diseases/ insects	**Output Targets 2016** • F_1, F_2 and BC populations developed from crosses involving powdery mildew resistant and susceptible lines screened against local isolate of powdery mildew (*Podosphaera xanthii*) at AVRDC East and Southeast Asia in Thailand • Recurrent selection cycle 4 completed at AVRDC East and Southeast Asia in Thailand emphasizing selection for yield, early fruit maturity, fruit quality and resistance to mildews.

Activity 1.9 Develop traditional vegetables with superior horticultural traits	*Output Targets 2016* • Manuscript on Malabar spinach (*Basella alba*) prepared for publication • 2-3 promising advanced lines identified, each of amaranth (*Amaranthus cruentus*), nightshade (*S. scabrum*), spider plant (*Cleome gynandra*) and African eggplant (*Solanum* spp.) from multilocation trials in Tanzania • Three F_3 populations developed from new amaranth crosses to improve the 'Madiira 1' type cultivar for early growth vigor, seed and vegetable yields, and deep green leaf color, shape and size • Two F_2 populations developed from crosses involving African eggplant (*S. aethiopicum*) cultivar 'DB3' created to develop lines with long season fruit set, stay-green leaves, and fruit with tolerance to spider mites and wilt diseases

Output 2: Vegetable variety testing networks and improved seed systems developed

Outcome: Improved distribution, evaluation, release, and seed production of AVRDC-bred varieties leading to (1) better understanding of genotype-environment interactions, (2) trait priorities for particular agroecosystems and markets, (3) streamlined variety release procedures, and (4) more efficient vegetable seed production

Activity 2.1 Assemble, internationally distribute, and evaluate performance of elite vegetable lines	*Output Targets 2016* • AVRDC chili pepper, sweet pepper, tomato, vegetable soybean, mungbean, onion, Malabar spinach, amaranth, African nightshade, spider plant and other AVRDC-developed lines distributed globally to international collaborators for testing • Breeders seed of at least three AVRDC elite onion lines and five local purified selections from Mali local onion populations produced • Vegetable soybean and mungbean lines promoted in Asia and sub-Saharan Africa through regional testing, ensuring participation of women farmers • Preliminary analysis of genotype-environment interactions conducted in amaranth and implications for breeding, variety release and germplasm collection assessed • Vegetable variety trials of AVRDC improved germplasm in Central Asia and the Caucasus analyzed and information returned to AVRDC breeding groups
Activity 2.2 Develop online seed catalog to facilitate seed requests for AVRDC-improved vegetables	*Output Target 2016* • Online seed catalogs developed or updated for tomato, pepper, soybean, leafy brassica Brassicaceae, Chinese cabbage (*B. rapa subsp. pekinense*), shallot (*Allium cepa* var. *aggregatum*), bitter gourd, onion, cucumber, pumpkin, rootstocks, amaranth and Malabar spinach

Activity 2.3 Monitor variety release, commercialization and adoption of AVRDC-bred lines	*Output Targets 2016* • Release and commercialization of AVRDC varieties by NARES and seed companies in Africa, Asia, Central America, and Central Asia-Caucasus monitored • Breeders seed of released AVRDC lines produced at AVRDC headquarters, regional offices, and in Central Asia and the Caucasus • Adoption of AVRDC-developed germplasm of tomato and pepper evaluated for South and Southeast Asia • At least three additional activities promoted and facilitated the availability of improved seed provided to partners in the countries where releases have been made
Activity 2.4 Use male sterility to improve the efficiency of hybrid vegetable seed production	*Output Targets 2016* • Seeds of potential sweet pepper restorer lines advanced from BC_4F_3 to BC_4F_4 • 3-4 inter-specific pepper crosses examined for male sterility expression to isolate alloplasmic cytoplasm

Output 3: Enhanced seed company capacity in vegetable breeding research, design and application of efficient seed systems, and delivering development outcomes

Outcome: Seed companies improved for capacity in vegetable breeding, seed production, or delivering technical advice and promotional messages

Activity 3.1 Collaboration with seed companies to understand key traits for design of improved breeding strategies	*Output Targets 2016* • A set of AVRDC tomato lines carrying different combinations of *Ty*-genes conferring resistance to tomato yellow leaf curl disease assessed for resistance against the locally prevalent leaf curl viruses in seed company-managed field sites in India, Thailand, the Philippines and Indonesia tested in second year trials
Activity 3.2 Equipping seed companies to promote nutrition and other development messages to men and women farmers through farmer field days	*Output Target 2016* • Opportunities identified in Africa/Southeast Asia to promote nutrition messages through seed companies

PRODUCTION: Safer and sustainable vegetable production systems

Goal: Sustainable livelihoods of smallholder vegetable growers and a secure supply of safer and affordable vegetables

Purpose: Smallholder vegetable growers (in target regions) adopt sustainable integrated production practices that are profitable and safer for the environment, growers and vegetable consumers

Output 1: Novel information generated for integrated crop management including pest, disease, and soil fertility management for sustainable vegetable production

Outcome: Information used by national agricultural research systems and other organizations to develop effective methods to manage major vegetable production constraints

Activity 1.1

Detect, characterize and explore integrated management strategies for major insect and mite pests

Output Targets 2016

- Association of molecular variations in *Spoladea, Pieris* and *Phyllotreta* populations with host plants and geographical origins in Southeast Asia and sub-Saharan Africa determined
- Most effective sex pheromone blends against *Pieris rapae* and *Spoladea recurvalis*, aggregation pheromone blends against *Phyllotreta striolata* and kairomone blends against thrips in Southeast Asia and sub-Saharan Africa identified
- Integrated pest management strategy based on sex/aggregation pheromones, kairomones, biopesticides and parasitoids for *P. rapae, P. striolata, S. recurvalis, Tuta absoluta, Aphis craccivora* and thrips validated in Southeast Asia and sub-Saharan Africa

Activity 1.2

Detect, characterize and explore integrated management strategies for major fungal and bacterial diseases

Output Targets 2016

- Control efficacy of boron compounds against anthracnose in chili pepper (*Capsicum* spp.) determined
- Prevalence of seed-borne pathogens in leafy brassica seeds used by farmers in Cambodia, Laos, and Vietnam, and appropriate seed treatment identified

Activity 1.3

Detect, characterize and explore integrated management strategies for major viral diseases

Output Targets 2016

- The important viruses and virus-like agents, especially begomoviruses, prevalent or emerging in vegetable crops in Asia and Africa identified and monitored
- The identity and genetic diversity of selected viruses and virus-like agents affecting vegetable crops in Asia and/or Africa assessed

Activity 1.4

Develop technologies to improve soil nutrient use efficiency and soil sustainability

Output Targets 2016

- Protocols for evaluating compatibility of scion/rootstock combinations for tomato (*Solanum lycopersicum*) validated
- Effect of starter solution and legume rotation on tomato production and soil health confirmed in Fiji
- Soil properties assessed and soil management programs developed for sustainable quality vegetable cropping systems in Eastern and Southern Africa

Output 2: Sustainable vegetable production practices developed/validated for targeted agro-ecosystems

Outcome: Integrated production technologies and related information to enhance and sustain vegetable productivity ready to be disseminated to national agricultural research and extension systems, nongovernmental organizations, input suppliers, and small-scale farmers

Activity 2.1

Develop and adapt integrated production technologies for intensive production system (system of cultivation using large amount of inputs, e.g. labor, capital, pesticides, fertilizers etc., relative to land area)

Output Targets 2016

- Integrated crop management technologies for tomato, pepper, and eggplant (*S. melongena*) validated in open field and adapted in South Pacific, Central Asia, and Mali
- Integrated pest management packages for eggplant, summer tomato, vegetable brassicas (Brassicaceae), country bean and yard-long bean (*Vigna unguiculata* subsp. *sesquepedalis*) validated and adapted in Southeast Asia (Vietnam, Cambodia, and Lao PDR) and South Asia (Bangladesh), and costs and returns documented for farmers adopting integrated pest management (IPM) methods
- Vegetable production under protective structures improved through adapting IPM practices, new crops, grafting (for open field production as well), and other crop management practices in India and Pakistan

Activity 2.2

Develop and adapt integrated production technologies for extensive production system (system of cultivation using small amount of inputs relative to land area)

Output Targets 2016

- Legume crops in rice-fallow areas introduced in India
- Home vegetable garden options for flood-prone target area of Odisha, India validated
- Mungbean production as part of the rice-wheat cropping system, intercropping with sugarcane or citrus, and double cropping in wheat-fallow areas and IPM practices validated in Pakistan

Output 3: Innovative dissemination processes in vegetable production initiated and outcomes assessed

Outcome: Smallholder vegetable farmers adopt new innovations with the support of input suppliers, marketing agents, and policymakers; this improves farm productivity and sustainability, strengthens the role of women, and enhances livelihoods

Activity 3.1 Identify and establish gender-sensitive and effective knowledge and innovation systems	*Output Targets 2016* • Data analyzed and results documented on farm-level constraints and opportunities to IPM adoption for vegetable legumes and leafy brassicas in Cambodia, Lao PDR and Vietnam • Innovation platforms on vegetable production for market sales and home consumption maintained in Vietnam and initiated in Burkina Faso, Cameroon and Ghana
Activity 3.2 Strengthen the capacity of local partners and farmers to facilitate and conduct innovation processes	*Output Targets 2016* • Extension and training materials published on various vegetable production technologies, distributed to men and women farmers • Capacity of extension staff, nursery operators and vegetable farmers (men and women) in India, Oceania, Central Asia and the Caucasus, Eastern and Southern Africa, and Central and Western Africa strengthened through training of trainers, farmer training, farmer field schools or field days
Activity 3.3 Identify challenges and opportunities to innovation adoption and evaluate outcome generated	*Output Targets 2016* • Data analyzed and results documented on the impact of eggplant and cucurbit IPM in Bangladesh

CONSUMPTION: Balanced diets through increased access to and utilization of nutritious vegetables

Goal: Consumer health improved by increased consumption of nutritious vegetables for a balanced diet

Purpose: Increased public awareness, accessibility and utilization of nutritious and diverse vegetables

Output 1: Knowledge of consumer behavior and nutritional properties of vegetables enhanced

Outcome: Research communities become aware of and better understand consumer attitudes towards health, food safety and vegetable consumption as well as the nutritional and functional values of vegetables

Activity 1.1

Assess consumption- and nutrition-related outcomes of vegetable producers and consumers in Asia and sub-Saharan Africa

Output Targets 2016

- Baseline study documented on food habits and dietary diversity of urban and rural households in Cameroon, Ethiopia, northern Thailand and Vietnam
- Survey conducted in targeted sites to evaluate the number of children between the ages of 6 and 23 months who consume a minimum acceptable diet in Mali
- Social-cultural factors contributing to technology dissemination approaches for use among men and women beneficiaries in Best Practice Hubs in Mali identified and documented

Activity 1.2

Study nutritional and functional values and benefits of vegetables from sub-Saharan Africa and Asia

Output Target 2016

- Nutritional and functional properties of selected traditional vegetables from Africa and Asia evaluated

Output 2: Dietary strategies and food based intervention packages developed

Outcome: AVRDC – The World Vegetable Center, national agricultural research and extension systems and nongovernmental organizations promote home, school and community gardening, distribute seed kits to disaster-affected areas and advocate more nutritionally effective use of vegetables.

Activity 2.1

Develop home, school and community garden packages for poor households in Asia and sub-Saharan Africa for technology adaptation and adoption, and increased access to vegetables

Output Targets 2016

- Centerwide coherent strategy on home gardens developed and documented; training manual for AVRDC home gardens developed
- Effect of school vegetable gardens on dietary patterns and nutritional awareness of school girls and boys in Burkina Faso, Bhutan, Nepal and Tanzania documented; baseline data collected, data analyzed and documented on the effect of home garden training and seed kits on vegetable production, consumption, dietary diversity and gender in Cambodia, Liberia, Uganda, Kenya and Tanzania
- Approximately 26,000 nutritional seed kits distributed to 12,000 home and school gardens with over 300 participatory demonstration vegetable gardens established in selected locations of Central Asia, Kenya, Mali, Tanzania and Uganda
- Best-bet public-private business model identified and implemented to produce and distribute seed kits through private seed companies in Kenya, Tanzania and Uganda

Activity 2.2

Develop nutritious vegetable seed kits for disaster relief in tropical and sub-Saharan Africa and Asia

Output Targets 2016

- Existing seed stocks made available for distribution in response to future disasters in exchange for funding to replenish seed stocks
- Easy-to-understand instructions on cultivation, field management, and food preparation in various local languages prepared for publication and disseminated in disaster-affected areas

Activity 2.3

Develop dietary strategies, nutrition-improved recipes and food preparation methods based on traditional diet and food practices for promotion of vegetables and nutrition to household women in Asia and sub-Saharan Africa

Output Target 2016

- Recipes for promotion in school garden program in Cameroon, Central Asia and Tanzania disseminated

Activity 2.4

Develop, validate and implement promotion strategies for increased consumption of vegetables and nutritious/diverse diets by poor households, emphasizing the needs and opportunities for women and children, in Asia and sub-Saharan Africa

Output Targets 2016

- Nutrition-focused mass communication plan developed in collaboration with national partners and national campaigns to amplify messages for home gardeners in Kenya, Tanzania and Uganda
- Nutrition leaflets, posters, booklets and recipe books for Central Asia developed, printed and distributed to men and women
- Promotional activities of vegetable recipes for school and community garden programs in Central Asia undertaken
- 1-2 farmer field and open days per country conducted in Central Asia and the Caucasus, Kenya, Mali, Tanzania and Uganda to promote increased production and consumption of vegetables, especially among women and children

Output 3: Approaches to enhance market efficiency and access developed, postharvest losses minimized and vegetable supply chains strengthened

Outcome: Small-scale farmers and other value chain actors in Africa, Asia and the Oceania benefit from improved market coordination along vegetable supply chains, improved postharvest practices, and enhanced research capacities and networks.

Activity 3.1

Analyze components of supply chains, marketing systems and postharvest handling of vegetables in sub-Saharan Africa, Asia and Oceania

Output Targets 2016

- Nutrient contents of selected vegetables following application of validated innovative postharvest handling technologies for vegetables monitored in selected countries in sub-Saharan Africa and Asia
- Feasibility studies on minimal processing and processing technologies as an alternative market conducted in Ethiopia, Tanzania, Malawi and Mozambique
- Market constraints and opportunities for smallholder women selling traditional vegetables in Kenya, Tanzania and Uganda assessed and options to improve market information systems identified

Activity 3.2

Facilitate the establishment of enhanced market coordination mechanisms for vegetable supply in sub-Saharan Africa, Asia and Oceania

Output Targets 2016

- Developed and/or improved postharvest handling technologies disseminated for adoption by beneficiaries in Africa and Asia via workshops and multi-stakeholder platforms/fora
- Options for linking young men and women beneficiaries to direct high value vegetable markets in Ethiopia, Tanzania, Malawi and Mozambique explored and targeted promotional activities to meet niche consumer market preferences for increased vegetable consumption undertaken

Activity 3.3

Develop and enhance training curricula and materials on proper postharvest management and marketing skills for trainers in Asia, sub-Saharan Africa and Oceania

Output Targets 2016

- International Vegetable Training Course curricula and lecture/training materials on vegetable postharvest handling, marketing and nutrition at AVRDC East and Southeast Asia reviewed and updated
- Training and other technology promotion materials in marketing and postharvest handling activities updated and disseminated to men and women beneficiaries in targeted locations in sub-Saharan Africa, Asia and Pacific
- Vegetable Postharvest Training Manual updated and translated into local languages for dissemination to men and women beneficiaries

Activity 3.4

Strengthen postharvest research capacity of national partners through training courses and raising awareness on postharvest losses and postharvest research at the national and regional level in Asia, Africa and Oceania

Output Targets 2016

- At least 1,000 men and women participants from Ghana, Kenya, Tanzania, Bangladesh, Cambodia and Nepal trained in postharvest handling practices through training of trainers courses and farmer training activities
- Regional postharvest training programs at the Horticulture Innovation Lab - Kasetsart University, Thailand conducted; upgrade of postharvest research laboratories of selected country partners in Africa and Asia assisted
- 3- to 5-day national and regional training of trainers courses on African traditional vegetable postharvest technologies delivered to 30 target beneficiaries from Burkina Faso, Cameroon and Ghana

Activity 3.5

Adapting available technologies and developing new technologies to meet the needs of the target value chain actors and stakeholders in selected countries in Asia and Africa

Output Targets 2016

- Appropriate postharvest handling technologies for selected vegetables to reduce losses and improve physical and nutritional quality of produce in Burkina Faso, Cameroon, Ethiopia, Ghana, Malawi, Malawi and Mozambique tested and validated in the field with men and women beneficiaries
- Most promising lines of long shelf life and processing tomato from advanced trials identified and recommended for adoption in Bangladesh, Cambodia and Nepal
- Field trials established and cost-benefit analyses of best-bet postharvest technologies determined for priority vegetables in Bangladesh, Cambodia, Ghana, Kenya, Nepal, Pakistan and Tanzania.

Output 4: Policy recommendations with an aim to increase vegetable consumption developed, capacity strengthened and technology and knowledge disseminated

Outcome: Consumers are aware of the health-promoting benefits of increased utilization of vegetables through better access to nutritional education information, enhanced capacities of national agricultural research and extension systems and nongovernmental organizations, and improved policy support.

Activity 4.1 Conduct training courses and promotion campaigns to increase production, utilization and consumption of nutrient-rich vegetables in Asia, Africa and Oceania	*Output Targets 2016* • 1-2 farmer field days conducted in Burkina Faso, Cameroon, and Central Asia and the Caucasus to promote increased production and consumption of vegetables • 3- to 5-day targeted training courses on participatory varietal selection, vegetable seed, and produce production, processing, preservation and utilization of vegetables delivered to 500-600 target youth and women groups in Burkina Faso, Cameroon, Ethiopia, Ghana, Malawi, Mali, Mozambique and Tanzania • 9,650 men and women participants from Bangladesh, Cambodia, Ghana, Kenya, Nepal, Pakistan, Tanzania and Uganda trained in postharvest handling practices through training of trainers courses and farmer training activities • Model farmers' packhouse improved in one target site each in Bangladesh, Nepal and Cambodia
Activity 4.2 Develop data collection protocols and policy briefs on outcome and impact assessment of program interventions in Africa and Asia	*Output Targets 2016* • VegOne, the centralized monitoring and evaluation database for the Center's performance indicators, updated and quarterly reminders for indicator updates sent • Support provided to the Agricultural Seed Agency of Tanzania to maintain the online VegOneX seed distribution system developed by AVRDC in 2015 • Outcomes of postharvest technologies promoted and training programs in Africa and Asia evaluated and documented

Projects in 2016

Project	Donor	Duration	Budget (in USD)
Multilocation evaluation of tomato lines carrying different combinations of *Ty* genes for resistance against begomovirus infection	Asia & Pacific Seed Association	2014 - 2016	278,263
International training workshop on postharvest management technology for horticultural crops	Asian Food and Agricultural Cooperation Initiative	2015 - 2017	68,579
Increasing productivity of allium and solanaceous vegetable crops in Indonesia and sub-tropical Australia	Australian Centre for International Research and Development	2013 - 2016	48,710
Improving livelihoods with innovative cropping systems on the East India plateau	Australian Centre for International Research and Development	2012 - 2016	89,454
Strengthening integrated crop management research in the Pacific Islands in support of sustainable intensification of high-value crop production	Australian Centre for International Research and Development	2011 - 2016	831,024
Promoting traditional vegetable production and consumption for improved livelihoods in Papua New Guinea and Northern Australia	Australian Centre for International Research and Development	2014 - 2018	126,031
Improving income and nutrition in Eastern and Southern Africa by enhancing vegetable-based farming and food systems in peri-urban corridors	Australian Centre for International Research and Development	2013 - 2016	1,968,407
The operations of the Humidtropics Innovation Platform in Cameroon	CGIAR	2015 - 2016	41,300
CGIAR Research Program for Humidtropics: Integrated systems for the humid tropics	CGIAR	2012 - 2016	2,143,212
Linking genetic resources, genomes and phenotypes of solanaceous crops	European Commission	2016 - 2019	168,263
A holistic multi-actor approach towards the design of new tomato varieties and management practices to improve yield and quality in the face of climate change	European Commission	2016 - 2019	276,755
Attraction in Action: Using pheromones and other safe and sustainable management strategies to reduce losses from insect pests and plant diseases on vegetable legumes and leafy brassicas in Southeast Asia	Federal Ministry for Economic Cooperation and Development, Germany	2014 - 2017	1,332,001

Project	Donor	Duration	Budget (in USD)
GlobE UrbanFoodPlus: Controlled central factorial experiments for participatory development, evaluation and demonstration of improved nutrient and water management strategies	Federal Ministry for Economic Cooperation and Development, Germany	2013 - 2016	124,209
Enhancing the livelihood opportunities of smallholder African indigenous vegetable producers through the development and implementation of IPM measures for arthropod and nematode pests	Federal Ministry for Economic Cooperation and Development, Germany	2014 - 2016	185,632
Horticultural innovations and learning for improved nutrition and livelihoods in East Africa	Federal Ministry for Economic Cooperation and Development, Germany	2013 - 2016	222,000
Wild Relatives to Fight Blight: Using wild tomato to enhance the resistance of tropical tomato cultivars against late blight	Federal Ministry for Economic Cooperation and Development, Germany	2015 - 2017	88,800
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	Federal Ministry for Economic Cooperation and Development, Germany	2015 - 2018	1,332,001
Improving rural livelihoods through innovative scaling-up of science-led participatory research for development in Karnataka	Government of Karnataka, India	2013 - 2017	231,000
Good Seed Initiative	Irish Aid, Ireland	2013 - 2016	135,854
Selection of tropically-adapted lines of vegetables to improve productivity of the vegetable value chain in Southeast Asia	Ministry of Agriculture, Forestry and Fisheries, Japan	2015 - 2016	147,058
Networking to enhance international cooperation in vegetable research and development	Ministry of Foreign Affairs, Taiwan	2015 - 2016	600,000
Mobilize resistance genes from wild tomato for breeding salt tolerant tomato cultivars	Ministry of Science and Technology, Taiwan	2014 - 2016	79,334
Identification and introgression of whitefly (*Bemisia tabaci*) resistance genes from *Solanum pimpinellifolium* to tomato	Ministry of Science and Technology, Taiwan	2015 - 2016	18,911
Development of breeding techniques and selection of virus resistant germplasm in pepper and tomato	Rural Development Administration, Korea	2014 - 2016	120,000
Cambodian Horticulture Project for Advancing Income and Nutrition	Swiss Agency for Development and Cooperation	2015 - 2017	539,345
Vegetables Go to School: Improving nutrition through agricultural diversification	Swiss Agency for Development and Cooperation	2013 - 2016	3,633,169

Project	Donor	Duration	Budget (in USD)
Evaluation and screening of Syngenta maize and vegetable hybrids for adaptation in Nigeria and skills development program for Syngenta staff	Syngenta Crop Protection AG	2014 - 2017	42,000
Utilizing the genome of the vegetable *Cleome gynandra* for the development of improved cultivars for the West and East African markets	The Netherlands Organisation for Scientific Research	2015 - 2017	6,105
Cereal-based Systems of West Africa: Vegetables and associated best management practices in cereal-based crop production systems to improve income and diets of rural and urban households in Northern Ghana & Southern Mali	United States Agency for International Development	2012 - 2016	871,544.00
Deploying Improved Vegetable Technologies to Overcome Malnutrition and Poverty in Mali	United States Agency for International Development	2014 - 2017	7,200,000
Africa RISING: Enhancing vegetable value chains in rice-based and sole crop production systems to improve farm household income and consumer access to safer vegetables in Morogoro, Tanzania	United States Agency for International Development	2012 - 2016	418,037
Enhancing partnership among Africa RISING, NAFAKA and TUBORESHE CHAKULA programs for fast-tracking delivery and scaling of agricultural technologies in Tanzania	United States Agency for International Development	2014 - 2016	370,678
Africa RISING: Enhancing vegetable value chains in rice-based and sole crop production systems to improve farm household income and consumer access to safer vegetables in Morogoro, Tanzania	United States Agency for International Development	2014 - 2016	591,147
Promoting science and innovation in agriculture in Pakistan - Agricultural Innovation Program	United States Agency for International Development	2013 - 2017	3,164,273
AVRDC Postharvest Program	United States Agency for International Development	2012 - 2017	5,000,000
Deploying vegetable seed kits to tackle malnutrition in Cambodia, Kenya, Uganda, Tanzania and Liberia	United States Agency for International Development	2014 - 2017	6,000,421
Enhancing productivity, competitiveness and marketing of traditional African (leafy) vegetables for improved income and nutrition in West and Central Africa	West and Central African Council for Agricultural Research and Development	2013 - 2016	658,018

FINANCES 2016

	AVRDC	CGIAR** recommended range
Cash management on restricted operations*	0.32	less than 1
Adequacy of reserves	137 days	75-90 days
Short-term solvency	165 days	90-120 days

Table 1. 2015 Revenues (in '000 USD)

Unrestricted grants	9,306	45%
Restricted grants	11,234	54%
Other revenues	243	1%
Total	**20,782**	100%

Unrestricted Grants

Republic of China (ROC)	4,516
UK Department for International Development (UK/DFID)	2,954
United States Agency for International Development (USAID)	1,000
Australian Centre for International Agricultural Research (ACIAR)	323
Germany	278
Thailand	124
The Philippines	50
Korea	50
Japan	11
Sub-total	***9,306***
Other revenues	243
Total	**9,549**

Restricted Grants

United States Agency for International Development (USAID)	5,170
* Republic of Germany (BMZ)	1,103
Swiss Agency for Development and Cooperation (SDC)	1,055
Republic of China / Ministry of Foreign Affairs (MOFA)	866
Australia / Australian Centre for International Agricultrual Research (ACIAR)	838
Consultative Group on International Agricultural Research (CGIAR)	534
Republic of China / Council of Agriculture (COA)	456
West and Central African Council for Agricultural Research and Development (CORAF/WECARD)	263
Korea / Rural Development Administration (RDA)	161
COFRA Foundation	131
Government of Karnataka	116
Others (projects with expenses less than 100K USD)	539
Sub-total	***11,234***
Total Revenues	**20,782**

* BMZ = Federal Ministry for Economic Cooperation and Development

Table 2. 2016 Final budget estimate (USD '000)

	2016 Estimate		2015 Actual	
Revenues	**21,006**		**20,782**	
Budget Allocations by Objects				
Personnel				
- International	6,137	29%	5,653	30%
- Local	5,411	26%	4,467	23%
Operations				
- Operational expenses, services	7,048	34%	6,999	37%
- Travel costs	1,281	6%	1,201	6%
- Training, Workshops and Meetings	573	3%	536	3%
- Equipment (Depreciation costs)	486	2%	267	1%
- Overhead Charge	1,404	7%	1,271	7%
Contingency	50	0%		
Sub-total	**22,390**	107%	**20,393**	107%
Indirect cost recovery (overhead)	-1,404	-7%	-1,299	-7%
Total	**20,986**	100%	**19,094**	100%
Changes in net assets	**20**		**1,688**	
Net assets at the beginning	7,533		6,416	
Change in net assets	20		1,688	
Net change in Capital Replacement Fund			-364	
Net change in Innovations Fund			-276	
Net change in self-sustaining operating fund			70	
Carried over / forward	7,552		7,533	
** Net Assets as of 31 December 2015:*				
Working Capital Fund			*2,000*	
Accumulated Fund			*3,265*	
Capital Replacement Fund			*469*	
Innovations Fund			*821*	
Fixed Asset Fund			*296*	
Self-sustaining Operating Fund			*682*	
Total			**7,533**	

Table 3 - Breakdown of Y2016 Estimated Revenues (USD '000)

Donor	2016 Estimate		2015 Actual	
Unrestricted Funding				
Republic of China (ROC)	4,262		4,515	
UK Department for International Development (UK/DFID)	2,173		2,954	
United States Agency for International Development (USAID)	1,000		1,000	
Australian Centre for International Agricultural Research (ACIAR)	294		323	
Germany	272		278	
Thailand	125		124	
The Philippines	50		50	
Korea	50		50	
Japan	11		11	
Sub-total	8,237		9,306	
Other revenues	200		243	
Total	**8,437**	***40%***	**9,549**	***46%***
Restricted Funding *				
USAID	5,955		5,170	
Republic of China (COA/MOST/MOFA)	1,226		1,393	
Republic of Germany (BMZ)	1,108		1,104	
Swiss Agency for Development and Cooporation (SDC)	1,360		1,055	
Australia / Australian Centre for International Agricultural Research (ACIAR)	1,299		838	
Consortium of International Agricultural Research Centers (CGIAR)	155		534	
Korea			161	
Others	1,466		978	
Sub-total	**12,569**	***60%***	**11,234**	***54%***
Total Revenues	**21,006**	***100%***	**20,782**	***100%***

* Contribution less than US$ 150,000 grouped under “Others”

* COA = Council of Agriculture; MOST = Ministry of Science and Technology; MOFA = Ministry of Foreign Affairs; BMZ = Federal Ministry for Economic Cooperation and Development

ACIAR	838,497	Germany/BMZ	1,103,181	SDC	1,054,924
AFACI	64,846	GoK	116,248	Syngenta Crop Protection AG	8,815
APSA	79,885	Kagome	8,032		
CGIAR	534,430	Korea/RDA	160,672	USAID	5,169,723
COFRA	130,945	MAFF	40,771	VW	27,769
CORAF/WECARD	263,249	ROC/COA	456,172	Others	163,185
European Union	15,371	ROC/MOFA	866,472	Miscellaneous	1,281
GCDT	58,314	ROC/MOST	70,798		

Acronyms & Abbreviations

AARNET	ASEAN-AVRDC Regional Network for Vegetable Research and Development
ACIAR	Australian Centre for International Agricultural Research
ASEAN	Association of Southeast Asian Nations
AVGRIS	AVRDC Vegetable Genetic Resources Information System
GDP	Gross domestic product
HACCP	Hazard Analysis Critical Control Point
IFAD	International Fund for Agricultural Development
IPM	Integrated pest management
IVTC	International Vegetable Training Course
MAGIC	Multi-parent advanced generation intercross
MARDI	Malaysian Agricultural Research and Development Institute
NARC	National Agricultural Research Center, Pakistan
NARES	National agricultural research and extension systems
QDS	Quality declared seed
QTLs	Quantitative trait loci
SGD	Sustainable Development Goals
SPC	Secretariat of the Pacific Community
SWOT	Strength - Weakness - Opportunity - Threat
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
VINESA	Improving Income and Nutrition in Eastern and Southern Africa by Enhancing Vegetable-Based Farming and Food Systems in Peri-Urban Corridors
VTIC	Vegetable Technology Immersion Cluster
WASH	Water - Sanitation - Hygiene

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