

AVRDC – The World Vegetable Center

2011-2013 Medium-Term Plan



AVRDC – The World Vegetable Center is the leading international nonprofit research and development institute committed to alleviating poverty and malnutrition in the developing world through the increased production and consumption of nutritious, health-promoting vegetables.

Published by

AVRDC – The World Vegetable Center
P.O. Box 42 Shanhua, Tainan 74199
Taiwan

T +886 6 583 7801
F +886 6 583 0009
E info@worldveg.org
I www.avrdc.org

AVRDC Publication: 11-745
ISBN 92-9058-185-9

Editor: Maureen Mecozzi
Cover: Chen Ming-che
Publishing Team: Kathy Chen, Vanna Liu, Chen Ming-che, Lu Shiu-luan
Photos: AVRDC Image Archive

© 2011 AVRDC – The World Vegetable Center

Suggested citation
AVRDC. 2011. AVRDC Medium-Term Plan 2011-2013. Shanhua, Taiwan.
AVRDC – The World Vegetable Center. AVRDC Publication 11-745. 88 p.

Contents

Foreword

A 'Revolution with Greens'

Vegetables provide the micronutrients missing from diets	1
--	---

Map

Regional Offices	8
------------------------	---

The Center's Strategic Organization

Germplasm	11
Breeding	11
Production	11
Consumption	11

Our Global Focus

Africa	13
South Asia	15
East and Southeast Asia	17
Central and West Asia and North Africa	19
Oceania	20
Latin America	21

A Network of Partners

Diverse partners	23
Supportive donors	24
Wide geographic span	24
Broad technical disciplines	24

The Center's Projects

Research and Development Projects	27
---	----

Research and Development

Theme Germplasm logframe	31
Theme Breeding logframe	41
Theme Production logframe	51
Theme Consumption logframe	59

Global Support

Administration and Services	67
Financial Management	68
Internal Audit	69
Human Resources	70
Communications and Information	72
Information Technology	74
Global Technology Dissemination	75
Biometrics	77

Staff – 2011	79
---------------------------	----

Budget	83
---------------------	----

Acronyms and Abbreviations	87
---	----

Foreword

Following the approval of the Center's new Strategic Plan for the period 2011-2025, AVRDC - The World Vegetable Center seeks in its Medium-Term Plan for the period 2011-2013 to implement its new strategic priorities with respect to research directions, locations, partners and funding. We seek to make a major contribution in fighting the battle against malnutrition and to play our role in helping to attain all eight of the Millennium Development Goals. This will involve elements of research, development and capacity building in consumption, production, breeding and the preservation and exploitation of the world's tropical vegetable germplasm. All these elements will seek to give greater emphasis to efforts to understand and promote improved nutritional intake, to combat hidden hunger in all malnourished people especially through the greater use of nutrient-dense indigenous vegetables which are presently vital to the diet of the world's poor.

As it is common in many countries that consumers include less than 200 gm of vegetables per day in their diets, it is evident from the evidence displayed in Figure 1 that rapidly increased child mortality and child under-nutrition are a likely consequence of falling beneath this threshold.

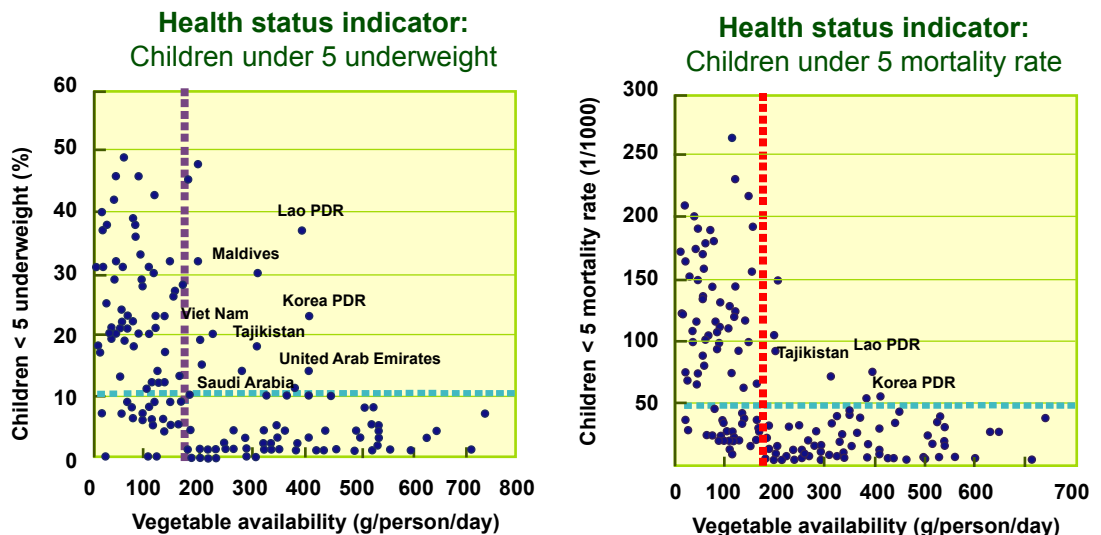


Figure 1: Health status indicators, children under 5 underweight, children under 5 mortality rate, by country.

The Center's ambition is to undertake the research, development and capacity building in congruence with its mandate and capabilities at a global level. However, in view of the continuing shrinkage of our budget resources over the last two years we need to be both pragmatic in what we seek immediately to achieve and also to continue ambitiously to seek funds from as diverse sources as possible. We aim for an expanded and more stable, better balanced budget in future and to avoid the uncertainty associated with over-dependence on one or two large donors.

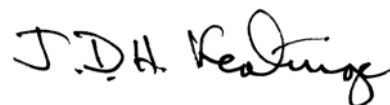
We believe that attainment of the 2011-2013 Medium-Term Plan outputs will make measurable, positive contributions to the Millennium Development Goals which summarize the mission for which AVRDC – The World Vegetable Center was made responsible by its benefactor founding nations and funding agencies in 1971. The past 40 years since the Center's formal inception have seen the Center contribute very substantially to vegetable research and development worldwide.

Exceptional in this record, as exemplars, may be cited: Our long history of capacity building in Asia through our Regional Office for East and Southeast Asia in Bangkok, Thailand; the achievement of pyramiding multiple resistance genes which are now being exploited worldwide in tomato in order to overcome *Tomato yellow leaf curl virus*; and, for the mungbean revolution in South and Southeast Asia, which has achieved continuing impact on millions of hectares and has been recently reported in the seminal “Millions Fed” document coordinated by the International Food Policy Research Institute.

However, while being able to look back with pride, AVRDC prefers to look forward with confidence to the future. In this future, we call for a further revolution:

Not a Green Revolution but rather a Revolution with Greens!

We believe this substantive change is attainable as described in this Medium-Term Plan 2011-2013 but I call upon all our donor supporters to help us continue the Revolution with Greens into the future so that we can truly have the impact that all of the Center’s Board of Directors and AVRDC staff seek to achieve.

A handwritten signature in black ink that reads "J.D.H. Keatinge". The signature is written in a cursive, flowing style.

J.D.H. Keatinge
Director General

AVRDC – The World Vegetable Center

2011-2013 Medium-Term Plan



A 'Revolution with Greens'

Over the last six decades, the development of more productive varieties of wheat, rice maize and cassava has led to a dramatic increase in the world's food supply. The improved varieties responded better to fertilizers, were higher yielding and were less vulnerable to diseases and pests. These plant breeding achievements occurred primarily in Asia and Latin America, two of the most densely populated regions of the world, but the effects have been felt throughout the world and have inspired hundreds of agricultural scientists working on other staple crops.

Replicating this 'Green Revolution' in sub-Saharan Africa, where the world's poorest and fastest-growing populations live, has proved challenging. One reason is that the region often lacks the necessary supporting infrastructure. Another is insufficient understanding of the local nature of agricultural development. People's attitudes toward new opportunities are driven firstly by their food choices and only secondly by affordable access to yield-boosting technologies, including improved crop varieties.

Starchy staple crops such as rice, maize, wheat, and cassava have been

the focus of much research and investment, yet an abundance of these crops will only amount to a 'Grain Revolution' or a 'Starch Revolution' if the other components of a balanced diet are not available. In addition to starch, protein, fat and fiber in the diet, many vital micronutrients are often only available by consuming fruit and vegetables. Vegetables are thus a critical source of micronutrients—a 'Revolution with Greens' is therefore necessary as well.

Although the world may be adequately fed by staple crops, it will not be nourished until diets improve and micronutrient malnutrition, the so-called 'hidden hunger,' is eliminated. Unless diets can be improved, millions of people with micronutrient malnutrition will remain vulnerable to ailments that compromise their mental and physical fitness. Worldwide, diseases related to imbalanced diets, especially insufficient vegetable and fruit consumption, cause 2.7 million deaths annually and are among the top mortality risk factors.

Micronutrient deficiencies, including lack of vitamin A, iron, and iodine, affect some 1 billion people and are extremely common among rural and urban populations in developing countries. The lack of essential nutrients leads to poor mental and physical development, especially among children, and causes poor performance in school and at work, further crippling communities already facing other health problems and poverty. Vitamin A deficiency can lead to permanent blindness in children and can suppress the immune system, predisposing children to respiratory tract infections, measles, and diarrhea. Inadequate intake of iron and zinc is also widespread. Low iron intake causes anemia which can lead to high mortality, particularly in women



of child-bearing age. Folic acid, which occurs at high levels in some vegetables, is critically important in developing fetuses for proper neural tube development and is vital in pregnant women to avoid anemia. Inadequate zinc intake is linked to learning disabilities, mental retardation, poor physical development and a reduced ability to fight infectious diseases.

Research on vegetables is severely under-funded and yet is critically needed. Staple crops, grown on a larger scale and with longer cropping cycles, tend to be vulnerable to climate threats and there is risk of crop failure. Such crop failures tend to be very conspicuous and easily dramatized. In contrast, vegetable crop species have shorter cycles, are faster growing, require little space, and are thus important for risk management. While they can be less influenced by environmental changes during the shorter growing season, they can be affected by pests and diseases, and are vulnerable to climatic events such as unexpected heavy rainstorms, strong winds, or flooding. Nonetheless, vegetables are the sustainable solution for a diversified and balanced diet; they provide essential nutrients, calories, protein, and fiber, and add color, texture, and taste to make staple foods more palatable.

Fortunately, a ‘Revolution with Greens’ is within reach. The message that a balanced diet is vital for human health has been clearly heard by policy makers around the world, and attempts are being made to link the agriculture and health sectors to ensure a common message is delivered, and acted upon. Vegetables provide not only important components of the human diet, but also are a source of family income, and provide a means of empowering women



through home gardening, postharvest value-addition and marketing.

Everywhere in the world, there are cultural preferences for particular ingredients, dishes, and ways of preparing food. Researchers can use this information to develop new vegetable varieties with specific fruit qualities (taste, shape, color, etc.) or purposes (fresh consumption, drying, pickling, etc.). This end-use breeding can be scaled up, not just for traditional farmers producing for their own consumption or local village markets, but also for specialty crop growers feeding industrial processors.

With farmer, marketer and end-user input and participation in the research processes, the end products are more likely to meet farmer and consumer preferences. On-farm evaluation requires the development of efficient mechanisms for monitoring progress, and making sure that researchers and farmers understand each other. The most effective participatory research programs ensure the continual flow of information from farmers to researchers and back to farmers. The choice of varieties must be location-specific, because vegetables respond to the specific environment in which they are grown; cultural preferences also differ from place to place. For example, cooks in one region or country might prefer sweeter red onions, while farmers elsewhere might prefer growing white onions that can be stored for a long time. The choice of the best varieties needs to be made by farmers themselves to identify the varieties most likely to be accepted by growers and consumers in their communities.

Bringing all the participants in the vegetable value chain together, and making sure that they continue to learn from one another, helps ensure that all

the participants have a voice which is heard in the development of research products, the implementation in the field and until high-quality products are available for the consumers. Their voice will be heard in the 'Revolution with Greens.'



There are eight key points to the 'Revolution with Greens': nourishing nutrients, valuable varieties, superior seeds, plentiful production, gender gain, profitable processing, meaningful marketing, and creative consumption.

Nutrients required for human health include macronutrients (carbohydrates, lipids, proteins, and water) that are consumed in large quantities and micronutrients (vitamins and minerals) that are consumed in much smaller quantities, although they are no less essential to health. While vegetables contain macronutrients, they are more importantly sources of micronutrients in the diet. These include vitamins which have a wide range of functions in vision, immunity, protection from harmful free radicals, and absorption of other nutrients. Minerals pass up the food chain from plants to humans; they can serve as electrolytes, affect the body's water balance, act as co-

factors for enzyme function, are components of bones and teeth, are part of nucleic acids, and are vital components of membrane function, thyroid hormone and hemoglobin. A 'Revolution with Greens' will help supply the critical components of the human diet. Deficiency in one or more micronutrients is not always apparent, but results in the 'hidden hunger' with serious consequences for the health and development of children, and the health and well-being of adults, particularly those from vulnerable groups such as pregnant and nursing mothers, and those with chronic diseases.

Valuable varieties are those which add value to vegetable production and are wanted by all the participants along the value chain. They may have higher yields, be resistant to pests and diseases, have more suitable growing habits, produce high quality products with appropriate characteristics (storage quality, color, texture and taste for consumption, require fewer inputs (pesticides, herbicides, fertilizers, labor) or may simply be varieties which will produce at least some yield in the most adverse conditions, thus contributing to risk management. Plant breeders who aim to produce these valuable varieties need to be aware of local, regional and



global requirements, must be able to predict production constraints, and be able to incorporate traits desired by consumers. All this needs to be done for many different types of vegetables, from the globally common tomato, cabbage and pepper, to the locally important indigenous vegetables around the world.

Superior seeds are a prerequisite for high-value crops such as vegetables. Quality seed is essential, but producing quality seed requires mastery of seed biology and the managerial skills to run a seed business. In addition to technical and managerial support, there are policy-related constraints to the supply of quality seeds. The biggest problem may be the private sector's lack of access to foundation seed—the earliest seed available for seed production—from the public sector. Developing innovative strategies that bring farmers, researchers, and seed producers and dealers together helps strengthen vegetable seed systems and will ensure access by farmers to locally adapted, affordable seed.



Plentiful production of vegetables is not only labor intensive but also knowledge intensive. Many technologies are available to facilitate vegetable production: starter solution

technology to enhance early seedling growth, protected cultivation to reduce pests and protect growing crops from environmental damage, mulching for weed control, integrated pest management technologies for different environments and water management technologies such as drip irrigation and hydroponic vegetable production. Capacity-building and information dissemination are vital for production of high quality and nutritious vegetables.

Women in particular benefit from vegetable production and consumption. In addition to the direct health benefits of vegetable consumption for women, vegetable production at the household level often allows the women to have better access to vegetables and some control over the vegetable consumption within the family, thus improving the nutrition of the women and children in the household. Direct sale of vegetables and postharvest processing for value-addition can bring much-needed income. Women also often have a key responsibility in vegetable marketing. Vegetable production thus has a very strong role in empowering women, in both rural and urban communities.

Vegetables are generally more perishable than staple crops, often requiring special treatment (such as cooling) to ensure that good quality, nutritious produce reaches the market. Shelf-life is often short, and vegetable production is often affected by produce gluts. Vegetable processing adds value. The processing can be simple, household level processing for longer storage, small-scale entrepreneurs (for example using solar driers), processing for urban consumption through packaging and preliminary preparation for busy urban families, to large scale processing for commercial sales. Vegetable processing can increase



incomes and ensure year-long access to nutritious vegetables and vegetable products.

Vegetable marketing functions best with a meaningful combination of postharvest technologies, value-addition, marketing and price information and access to markets. Vegetables are generally easily perishable, require careful harvesting, often need refrigerated storage, and require careful handling and packing. Their very perishability means that they are very suitable for postharvest processing with appropriate technology, thus adding value, preserving the produce, lengthening shelf-life and reducing waste. Timely access to markets is critical to assure good prices for farmers and consolidators, and affordable, good quality products for consumers. Market information needs to reach the farmers and other market chain participants in a timely manner.

It is not enough to know how to grow vegetables; people also need to know how to prepare them in a way that will preserve the nutrients and will make the vegetables attractive, tasty and palatable. Foods can confer health benefits beyond their nutritional value, for example dietary fiber. New recipes, attractive presentation of food, different vegetables: creative consumption. Many women's groups are taking part in training activities on preparation methods to improve the nutritional value of cooked foods. Creative consumption starts with children of school age, and continues throughout a healthy life with a diverse diet which includes the sources of micronutrients: vegetables.

An agricultural revolution that works for farmers, businesses, consumers and the environment will involve more than just producing enough calories of starchy crops. It will also need to deliver a diversity of vegetables, from amaranth, cowpea leaves, and African nightshade to high beta-carotene tomatoes and flood-tolerant sweet pepper and add a much-needed measure of nutrition, health, and flavor to staple-based diets—a true 'Revolution with Greens.'





Regional Offices



- 01_AVRDC - The World Vegetable Center, Headquarters - Taiwan
- 02_East and Southeast Asia (ESEA) - Bangkok, Thailand
- 03_Project Office - East Java, Indonesia
- 04_Project Office - Honiara, Solomon Islands
- 05_Korean Sub-Center - Suwon, Republic of Korea
- 06_Regional Center for South Asia (RCSA) - Hyderabad, India
- 07_Office for Central Asia and the Caucasus - Tashkent, Uzbekistan
- 08_Regional Center for Central and West Asia and North Africa (CWANA) - Dubai, UAE
- 09_Regional Center for Africa (RCA) - Arusha, Tanzania
- 10_Sub-Regional Office for West and Central Africa - Bamako, Mali
- 11_Project Office - Niamey, Niger
- 12_Project Office - Yaoundé, Cameroon
- 13_Oceania (through Headquarters, Taiwan)



Figure 2: Region/theme matrix

AVRDC – The World Vegetable Center was founded in 1971 with headquarters in Shanhua, Taiwan. As the Asian Vegetable Research and Development Center (AVRDC), its mandate was to support vegetable research for development in Asia, with a particular emphasis on Southeast Asia. In the early 1990s expansion outside the region began, culminating in its renaming to AVRDC – The World Vegetative Center in 2008 to reflect its geographical scope.

In addition to its headquarters in Shanhua, Taiwan, the Center currently has regional offices in Bangkok, Thailand (for East and Southeast Asia), Arusha, Tanzania (Regional Center for Africa), Hyderabad, India (Regional Center for South Asia) and Dubai, United Arab Emirates (Central and West Asia and North Africa). AVRDC has additional offices and staff members in the Solomon Islands, Indonesia, Madagascar, Cameroon, Mali, Niger and Uzbekistan.

The Center's research and development expertise is structured under four broad themes that work as a matrix with the regional centers and headquarters. The themes cover the whole vegetable value chain: collecting germplasm and ensuring seed availability; breeding for improved lines; improving production; promoting better postharvest handling and marketing; and finally, consumption and nutrition (Fig. 2).

Theme 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 evaluated to identify those accessions with desirable traits, and their genes identified, characterized, and introgressed using classical and molecular technologies

Theme Breeding

Genetic enhancement and varietal development of vegetables

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

Purpose: Farmers obtain varieties and lines of major vegetables that produce high yields of nutritious and marketable food with less health risk and environmental damage.

Theme Production

Safe and sustainable vegetable production systems

Goal: Substantial contributions to safe and sustainable vegetable production generated.

Purpose: Increased supply of safer vegetables through adoption of profitable, environmentally sound practices by farmers leading to knowledge-based farming.

Theme Consumption

Balanced diet 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.

Each theme conducts basic and applied research, working with many public and private sector partners. Additionally, each theme has a development component, with impact as the objective. Thematic research and development involves laboratory studies, field trials at locations around the world, participatory research and development work with national agricultural research and extension systems, the private sector, nongovernmental organizations, women's groups, farmers' organizations, and other partners. The Center's strong capacity-

building and promotion activities with the public and private sectors, led by the Global Technology Dissemination group, ensure widespread awareness and adoption of improved vegetable technologies.

The organizational structure of AVRDC – The World Vegetable Center has been streamlined to serve the needs of an increasingly decentralized institution (Fig. 3). The Center is guided at the senior management level by a Director General and two Deputy Directors General (Research; Administration and Services).

A Director of Finance, a Human Resources Director, Global Theme Leaders, and Regional Directors comprise a further level of management and participate in two committees: the Institutional Management Committee (chaired by the Director General) and the Institutional Research and Development Committee (chaired by the Deputy Director General – Research).

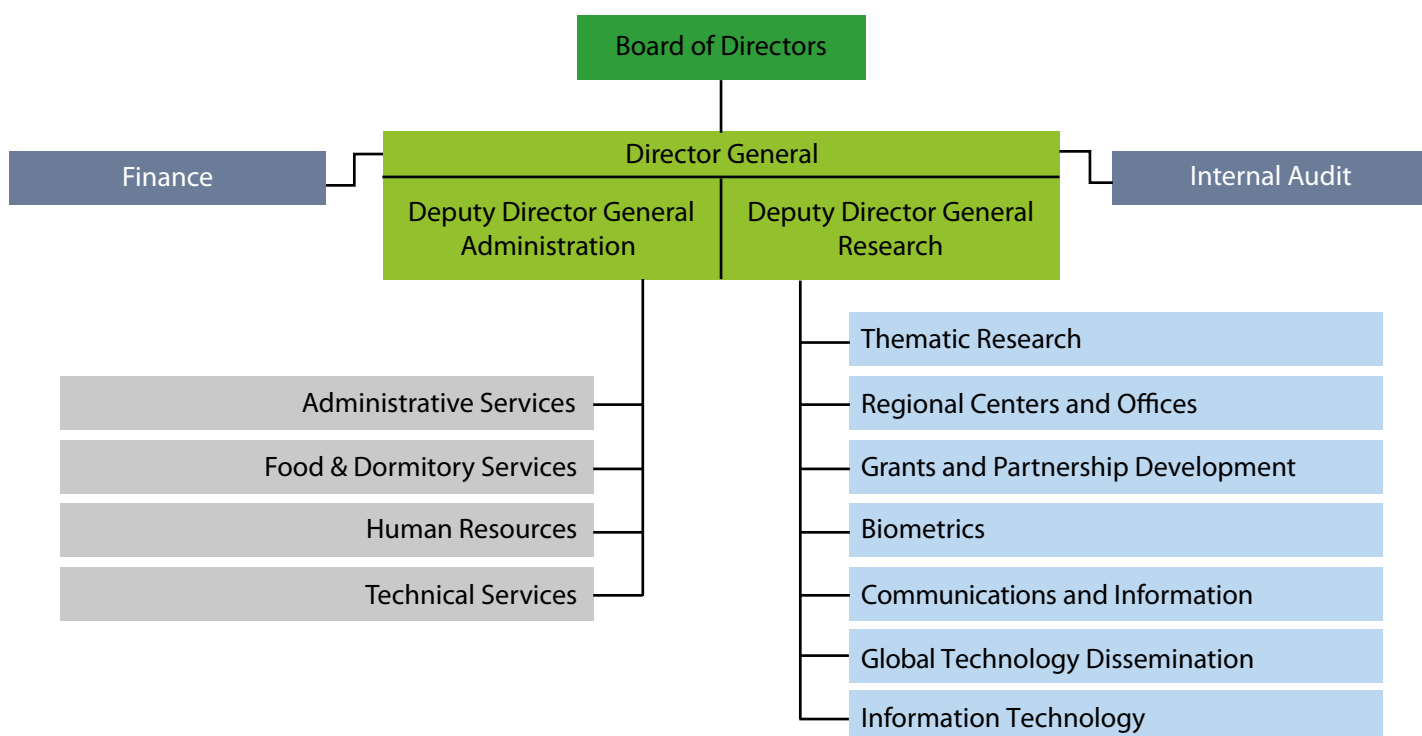


Figure 3: Organizational chart

Our Global Focus

Through its regional centers and project offices, AVRDC – The World Vegetable Center gains an intimate, up-to-date understanding of the economic, environmental, and social constraints faced by the rural and urban poor in developing countries. Close ties to communities, regional organizations, and national institutes ensure our global research has local impact and purpose.

Regional Center for Africa

Established in 1992, the Regional Center for Africa (RCA) based in Arusha, Tanzania has offices in Tanzania, Mali, Niger, Cameroon, and Madagascar. The Center operates in these countries through Memoranda of Understanding (MOU) that provide various levels of immunities and/or tax exemptions in each host country.

In 2010, RCA's human resources reduced from 22 to 13 international staff and from 59 to 29 national staff, due to the premature conclusion of the 'Vegetable breeding and seed systems for poverty alleviation in Africa' (vBSS) project. A strategic scaling back of activities was undertaken, which focused on (i) fast-tracking a small number of lines of 3 - 4 crops that are of clear benefit to smallholders with respect to

income generation and nutrition and that had demonstrated success in the previous two years and (ii) consolidating linkages with the private sector for dissemination and the public sector for a conducive policy environment with respect to variety release and seed certification. Thus, a total of 73 improved lines from 12 crops are at different stages of release in sub-Saharan Africa (SSA) with about 25% already on the market.

Issues pertaining to creating a more conducive policy framework (overcoming difficulties in getting lines released and certified, lack of access to foundation seeds improving growers' access to high quality seeds of improved varieties, protecting the intellectual investment of those involved in developing new varieties) were also addressed. The emerging seed companies in SSA have adopted a low-risk approach to investment, notably in human resources, for the acquisition of improved lines. Therefore, they will continue to depend on public institutions like AVRDC, not only for the development and channeling of new varieties through efficient delivery pipelines, but also for support in building skills for the production and marketing of quality seeds. While these issues are intrinsic to a formal seed sector, the Center realizes that community-based



seed systems should also be promoted, particularly when there is no operational seed sector – whether this will be seen as competition by the current seed sector should be analyzed on a country to country basis. RCA’s research established that there was an urgent need to ensure that the demand for the various categories of vegetable seeds (breeder’s seed, foundation seed, and certified seed) at the various levels of the seed production and commercialization cascade is met with adequate supply from the various operators. A most significant achievement of RCA was in championing an operational framework for licensing foundation seed production, which is expected to have a major impact because of the chronic mismatch between the demand of private seed entrepreneurs for foundation seeds and the supply capacity

of the public sector agricultural seed agencies.

The Center’s research also established that there was a diversity of seed distribution channels across the region, depending on the extent of formalization of the seed delivery systems. Nonetheless, each channel can derive benefits from promotional activities such as seed fairs, field days, and demonstrations that create awareness of new varieties and demand for these varieties. RCA successfully pursued these approaches across the region and further supported the delivery system by (i) availing breeders’ seeds where needed, (ii) training communities for setting home gardens, and (iii) exploring linkage of vegetable producers to the nascent processing industry.

In 2011, RCA will bring to completion the infrastructure upgrade that begun in 2008, consolidate the increased efficiencies in finance and procurement, and aim to anchor the RCA on a lighter but more disciplinary balanced operational structure (smaller offices) supported by strong partnerships. Operations in Madagascar will be concluded. Cognizant of the poverty and nutritional demographics imposed by increased urbanization, the Center will seek to work with staple crop international agricultural research centers on food and nutritional security with a focus on issues pertaining to (i) vegetables as companion crops to staple food crops and (ii) resource use efficiency and safety in urban and peri-urban settings.

In 2012, RCA will aim to commemorate twenty years of presence in sub-Saharan Africa. The single most important measure of the success would be on the extent that stronger capacity for vegetable research and development would have been achieved as a result of the Center’s work. Therefore, the RCA will seek to invigorate network support mechanisms as the most desirable and most cost-efficient approach to vegetable research and development in





the region, in pursuing core activities on improved varieties and seed systems, good agricultural practices for increased nutrition and income, supportive policies, and capacity building through short to medium duration group training modules.

In 2013, RCA will aim to conclude realignment with the major geopolitical research and development domains, with a split of the region into two regional offices, one for Eastern and Southern Africa (based in Tanzania) and another for West and Central Africa (based in Mali), to increase operational efficiencies. Taking cognizance of the increased devolvement of national agricultural research systems' research and development prioritization and coordination to sub-regional organizations (SRO) such as CORAF/WECARD (Conseil Ouest et Centre africain pour la recherche et le développement agricoles /West and Central African Council for Agricultural Research and Development) in West and Central Africa and ASARECA (Association for Strengthening Agricultural Research in Eastern and Central Africa) in Eastern and Southern Africa, the Center will pursue its gradual shift towards SRO-focused

partnerships, which would be in line with the regional dimension of AVRDC agenda. Likewise, RCA will consolidate relationships with entities of regional or international scope/mandates, e.g. Alliance for a Green Revolution in Africa (AGRA; joint training, support of AVRDC to the African Centre for Crop Improvement (ACCI)/ West Africa Centre for Crop Improvement (WACCI) graduate training with possible placement of students at AVRDC). This shift would facilitate the management of partnerships as well as providing an active dimension to the partnerships.

Regional Center for South Asia

Hosted by the International Crops Research Institute for the Semi-Arid Tropics in Hyderabad, India, AVRDC's Regional Center for South Asia (RCSA) with its new independent office building hosts three international and nine national staff whose activities are in line with the Center's four research and development themes.

The year 2010 witnessed the relocation of the Center's global legume breeding program from the headquarters to RCSA. The newly appointed legume breeder initiated his activities with a

major emphasis on mungbean and vegetable soybean. RCSA has also been undertaking drought and heat tolerance evaluation trials for tropical tomato; six lines have been selected under drought stress and five lines have been found tolerant to *Tomato yellow leaf curl virus*, powdery mildew, tospovirus, and crown root rot. Further work is in progress on legumes and solanaceous crops to increase the resilience of smallholder farmers in uncertain and unpredictable climatic conditions.

Another continuing major activity is a development project supported by the Sir Ratan Tata Trust. The project seeks to improve the livelihoods of poor farmers in Jharkhand and Punjab by increasing their income from vegetable production and encouraging consumption of vegetables for healthier diets. Improved production technologies, such as the use of nethouses for growing vegetables, healthy seedling nurseries, integrated pest management to reduce the frequency of pesticide application, and improvement of soil fertility, are

evaluated and adapted to the needs of the small-scale farmers. Participatory evaluation trials are conducted to select superior lines of tomato, chili pepper, mungbean, vegetable soybean and other crops.

One of the major strengths of RCSA lies in its capacity-building activities. More than 14,000 farmers have been trained on integrated pest management and vegetable cultivation through demonstrations in more than 8,000 farmers' fields across in both Jharkhand and Punjab. Informative fact sheets in local languages were distributed to farmers to support the adoption of the improved varieties and technologies. These activities will continue to that AVRDC can reach out to a greater numbers of beneficiaries.

Home gardens, one of the crucially important components of the fight against malnutrition among households in South Asia, are another emphasis in RCSA. Results of an initial assessment of nutritional health indicators among the poor in the target areas of Punjab and Jharkhand indicate that 82% of



the population is anemic and 31% is underweight. The Center's 'Home Gardens for Household Diet' adapted for Punjab and Jharkhand provides more than 100% of daily recommended levels of vitamins A and C, in addition to significant amounts of calcium, iron and protein. The Center advocates modified food practices, and has crop recommendations and recipes for vegetables that ensure bioavailability to alleviate the prevailing nutritional deficiencies. With the understanding of the substantial potential of home gardens to improve the nutritional status of the poor households, the Center plans to scale out the effort in other countries in the region such as Bhutan and Bangladesh.

In summary, activities for 2011 and onwards will continue to validate integrated pest management packages for target crops and balanced fertilization packages under open-field and nethouse production systems. RCSA will produce and prepare extension brochures on various aspects of safer vegetable production technology, promote home gardens, produce and distribute home garden seed kits, evaluate the nutritional and social-economic impact of home garden practices on household members, conduct home gardening courses and develop and publish nutrition leaflets, posters, booklets and recipe books for distribution. The legume breeding activities at RCSA will continue and be strengthened with a global focus, addressing the needs of the poor throughout the developing world.

East and Southeast Asia

In 2010, AVRDC's Asian Region Center (ARC), which was established in 1992 with the support of the Royal Thai Government and Kasetsart University in Thailand, was formally renamed Regional Office for East and Southeast Asia (ESEA) to complement the roles of the other regional offices in Asia. Since Asia encompasses vastly different



countries, climates and concerns, the name change allows the Center to fine-tune its programs to a greater degree and ensure maximum effectiveness, particularly for the small-scale farmers, public institutions, and the private sector across the region. The new name clarifies AVRDC's role for donors by stating unambiguously where AVRDC works and, thus, allows them to match their priorities to AVRDC's strengths in the countries of the region.

In 2010, ESEA had a total of 21 staff members, 7 of them at the administrative office on Kasetsart University's Bangkhen Campus in Bangkok, while the remaining staff are based at ESEA's Research and Training Station on Kasetsart University's Kamphaeng Saen Campus, which is located in the municipality of Kamphaeng Saen, Nakhon Pathom province, about 80 km northwest of Bangkok.

With the transfer of the cucurbit breeding program from headquarters to the region, a senior breeder joined ESEA in May 2010 and initiated the crop improvement program for bitter melon (*Momordica charantia*) and pumpkin (*Cucurbita moschata*). Further research activities in 2010 focused on the effect of shading and water management on the antioxidant activity of three Southeast Asian indigenous vegetables (*Polygonum odoratum*, *Linnophila aromatica* and



Acacia pennata), as a component of the JIRCAS (Japan International Research Center for Agricultural Sciences) program “Value-addition to Asian Agricultural Products.” Since May 2010, ESEA is actively involved in the three-year GIZ (Gesellschaft für Internationale Zusammenarbeit)-supported project “Less loss, more profit, better health: Reducing the losses caused by the pod borer (*Maruca vitrata*) on vegetable legumes” by coordinating the project’s activities in Southeast Asia.

In April 2010, ESEA organized the final workshop of Asian Development Bank-supported project entitled “Support of Vegetable Value Chains in GMS Countries for Prosperity and Poverty Reduction.” ESEA further hosted the annual Global Theme Meetings of the Themes Breeding and Consumption in October 2010.

As in the previous two decades, capacity development for researchers and extensionists from agricultural research institutes, universities, non-governmental organizations and the private sector were one of the cornerstones of ESEA’s

activities. From 20 September to 10 December 2010 a total of 16 participants from nine countries attended the 29th Regional Training Course entitled “Vegetables - From Seed to Table and Beyond”.

For the first time, ESEA joined the “Kaset Fair,” an annual week-long agricultural exhibit organized by Kasetsart University in Kamphaeng Saen. AVRDC’s global work was displayed by showcasing “Home Gardens of the World” and featuring AVRDC’s mature technologies such as vegetable grafting, microirrigation as well as improved breeding lines and varieties.

In 2011, ESEA will continue to strengthen and expand its scientific cooperation with Kasetsart University as well as with other institutions and networks in the region, particularly the ASEAN (Association of Southeast Asian Nations)-AVRDC Regional Network (AARNET). ESEA will participate in two projects of the USAID (United States Agency for International Development)-supported Horticulture Collaborative Research Support Program (HortCRSP)

in Cambodia, Vietnam and Thailand and assist in the preparation and conduct of two international conferences, namely the “6th International Workshop on Management of the Diamondback Moth and Other Crucifer Insect Pests” in March 2011 in Kamphaeng Saen and the “Regional Symposium on High Value Vegetables in Southeast Asia” in January 2012 in Chiang Mai, Thailand. The 30th International Vegetable Training Course, which was renamed as such to reflect the internationality of its participants, is scheduled from 12 September to 2 December 2011.

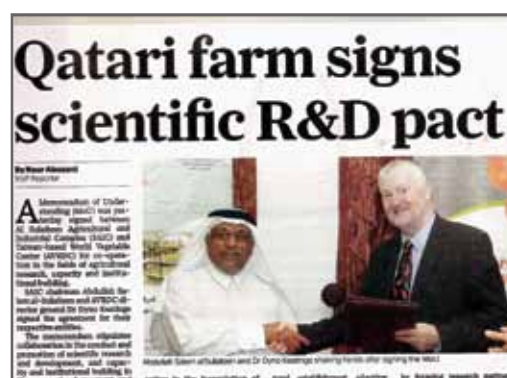
Central and West Asia and North Africa (CWANA)

The CWANA regional center was established in October 2009. Research and development activities are coordinated through two offices in Tashkent for Central Asia and Caucasus and in Dubai for West Asia and North Africa. The Regional Director is based in Dubai, United Arab Emirates.

During 2010 major activities focused on collaborative research with partner institutes on regional varietal trials, adoption and adaptation of production techniques, capacity development

including workshops, training, field days and information dissemination, and collection and establishment of baseline data on vegetable production and consumption.

The presence of AVRDC – The World Vegetable Center in CWANA was strengthened during 2010 through the signed agreement with the International Center for Agricultural Research in the Dry Areas (ICARDA) to serve the increasing interest in the potential of vegetable production to alleviate poverty and reduce malnutrition in dry areas. In Bahrain and Saudi Arabia, partnership for technology development and adaptation in vegetable production was established with NARES and the Taiwanese Technical missions. A technical cooperation agreement was signed with Al-Sulaiteen Agricultural





and Industrial Complex (SAIC), Qatar to facilitate training activities. The 2nd Executive Committee meeting of AVRDC's Board of Directors for 2010 was held in Dubai and this was an opportunity to enhance the Center's relationship with different research and development institutions in the United Arab Emirates and with the International Center for Biosaline Agriculture (ICBA) in Dubai.

Protected cultivation is the important facet of the Center's activities in CWANA. In West Asia, production techniques for water saving and quality enhancements were introduced to partners and will continue to be a focus, as will regional variety trials which give very promising results and will continue to be used to showcase the Center's most promising lines.

Looking ahead, activities of CWANA on vegetable production, consumption, variety trials and evaluation will continue. Development of technology packages for the production of high quality vegetables

in open field and protected cultivation will be emphasized through stronger collaboration with both national partners, and regional and international centers in the region.

Oceania

The Center has operated in Oceania since 2007 through a project funded by the Australian Centre for International Agricultural Research (ACIAR). The project focuses on smallholder vegetable production systems in the Solomon Islands. After more than three years operation, suitable varieties and production practices have been adapted locally. Dissemination activities started with training of trainers. The project not only aims to increase productivity within a short period but also considers sustainability of natural resources, such as soil fertility and water. With financial support from the Ministry of Foreign Affairs of Taiwan, promotion activities on vegetable consumption were conducted. The first activity was

to organize a stakeholder workshop to understand the concerns on imbalanced diets and the importance of increasing vegetable consumption. The participants also identify effective promotion programs. Songs and dramas as ways to educate villagers were created and pilot performances were conducted in a few villages. Seeds and growing information were distributed and cooking demonstrations were conducted. Responses were positive and there are opportunities to scale out the promotion.

The importance of having a system to introduce, evaluate and disseminate new technologies regularly was discussed with ministries and leading non-governmental organizations. Without such a system, the national agricultural research and extension systems will not be able to operate effectively to face the challenges derived from climate change and other constraints. Building proper capacity in the country is the key for developing such a system. AVRDC has started this effort but more needs to be done.

Better and more regular communications with the Australian Centre for International Agricultural Research (ACIAR) and the Secretariat of the Pacific Community (SPC) are taking place, both in the context of specific project activities and in the terms of the Center's regional presence throughout the Pacific. It is clear that joint and collaborative effort is required to alleviate poverty, severe deficiency of vitamin A and other micronutrients and the high diabetes rate in the region. Vegetable production and consumption can play a major role in income generation and health promotion. In seeking sustainable productivity increase, research and extension capacity need to be increased. Activities starting from conserving and utilizing local germplasm, breeding for locally important constraints, such as salinity, and adapting production practices suitable for local ecosystems need to be conducted. Promoting the health benefits of vegetable consumption and of a balanced, nutritious diet should

be done concurrently. The Center is ready to embark on larger, regional operations in Oceania whenever financial support becomes available.

Latin America

While establishment of a regional base in Latin America would facilitate the Center's ability to extend its activities to this region and bring positive impact, the Center's technologies nonetheless have great possibilities for spillover into tropical and subtropical Latin America. Vegetable varieties developed by the Center address major regional production constraints such as tomato-infecting begomoviruses and yield losses due to anthracnose in sweet pepper. Through the HortCRSP project led by the University of Wisconsin-Madison, collaborators in Honduras (Fundación Hondureña de Investigación Agrícola), Nicaragua (Universidad Nacional Agraria), and El Salvador (CARE-El Salvador) identified disease-resistant AVRDC tomato and sweet pepper lines demonstrating high yield and fruit qualities in regional trials. Access to high quality seed of these superior varieties would greatly benefit the region's farmers and consumers and the project has set its sights on improving technical and entrepreneurial skills of small-scale producers in production and marketing of vegetables and vegetable seed. Technical expertise in vegetable and seed production offered by AVRDC and the University of Wisconsin (UW) will be complemented by business skill expertise provided by the UW-Madison School of Business and Hortifruti-Wal-MartCentroamérica.





To further its research and development mission of alleviating poverty and malnutrition in the developing world, AVRDC – The World Vegetable Center needs to maintain the relevance of its work by keeping a global perspective when addressing local or regional constraints and opportunities. At the same time, experience gained in learning and solving problems locally needs to be fully utilized to broaden the Center’s capacity to react to global issues. In this context, it is crucially important that the Center maintains and builds a wider network of competent and dedicated partners. Currently, AVRDC collaborates harmoniously with more than 170 partners in 80 countries.

Diverse partners

The Center’s partnership with advanced research institutes including public research laboratories, universities and private research facilities in Australia, New Zealand, Europe, the United States, India, Japan and South Korea, among others, is one facet of the synergies supporting the Center’s research activities. Exchange of information, germplasm, breeding materials and staff expertise provides tremendous benefits to all members of the partnerships.

Tapping into local and regional resources, the Center actively seeks collaboration with national agricultural research and extension systems, non-governmental organizations and community-based organizations. These partners form effective national platforms through which the Center obtains a better understanding of what are perceived as constraints and opportunities among smallholder farmers in the developing world. National agricultural research and extension systems play an essential role in releasing AVRDC-bred, improved vegetable lines and adapting technologies pertinent to specific local needs. Non-governmental organizations and community-based organizations are key partners in scaling out research and development

implementation through dissemination of best agricultural practices in vegetable production, raising awareness of the nutritional importance of vegetables, and building capacity of the Center’s target beneficiaries.

AVRDC – The World Vegetable Center’s substantial contributions to global seed business have been appreciatively returned by the private sector through stronger linkages and support to our research and development of new vegetable varieties and good parental materials. Although multinational seed companies are the ones who can usually afford to contribute to the Center, we put special emphasis on fostering small- and medium-sized seed enterprises in developing countries by strengthening their capacities in breeding and seed production, increasing access to markets and better marketing strategies. The final goal is to provide a sustainable supply of quality seeds bred according to local requirements and to help small-sized seed entrepreneurs become key partners in the delivery of these seeds to a strengthened national vegetable sector.



Supportive donors

AVRDC enjoys a strong, encouraging relationship with many donors dedicated to rural development. The Center has a proven track record as a reliable partner capable of delivering results and impact. Our donor support is both in terms of unrestricted contributions to the Center, as well as specific, targeted project funding; some donor interests are represented on our Board of Directors. The Center works to keep the donors well informed and help align their strategies to the needs of the poor in developing countries in terms of alleviating poverty and ensuring better nutrition through vegetable production and consumption.

Working closely with advanced research institutes, national agricultural research and extension systems, non-governmental organizations, community-based organizations, the private sector and its donors, the Center strives to develop coherent strategies to capture opportunities and address challenges faced by small-scale farmers and their communities.

Wide geographic span

The Center's partners are positioned all over the globe, from very small island nations of the Pacific to very populous nations such as India or China; from countries located in the arid Sahel to those with the very wet climates of Myanmar and Bangladesh. The varied locations of partners, and thus different agroecological characteristics, provides a wealth of opportunities to learn and address the multitude of constraints faced by small-scale farmers, to test our research results against of various challenges and to adapt our technologies to be truly relevant globally.

In addition to the already extensive network the Center has started to work with, and in many cases where

appropriate has signed Memoranda of Understanding, AVRDC is pursuing linkages with further partner countries and organizations. The Center plans to utilize these working collaborations for the fullest benefits of the partnerships in creating positive impacts to ease poverty and malnutrition among the poor.

Broad technical disciplines

Realizing the limitation of its capacity to over-arch the whole effort of increasing production and consumption of vegetables, the Center consciously expands collaboration with partners from different, yet related disciplines, with its vegetable research and development. Stronger collaboration with mass media and communication institutions support the expansion of information on the Center's vegetable production technologies. Without stepping over the delicate lines of medical ethics the Center carefully forges teamwork with human health institutions to evaluate specific beneficial claims of vegetable consumption. Other disciplines with which the Center seeks to work include water resources management, natural disaster rehabilitation and intellectual property rights.





The Center's Projects

AVRDC – The World Vegetable Center's competent, multidisciplinary, innovative teams of scientists implement research and development projects globally to address constraints and opportunities in vegetable production and consumption.

The Center's projects cover a wide range of topics, from advanced applied and adaptive research, basic and applied development to technology transfer and dissemination along the research and development continuum. These projects are in the context of the Center's Strategic Plan 2011-2025, supporting AVRDC's mission. The table on the facing page lists the projects the Center is implementing.



Research and Development Projects

27

Project Title	Donor Name	Duration of Project
Scaling up farmer-led seed enterprises for sustained productivity and livelihoods in Eastern and Central Africa	World Bank, subcontracted through Association for Strengthening Agricultural Research in East and Central Africa	Dec 2009 - Jun 2012
Integrated crop management package for sustainable smallholder gardens in Solomon Islands	Australian Centre for International Agricultural Research, Australia	May 2007 - Jun 2011
Strengthening the Cambodia and Australian vegetable industries through adoption of improved production and postharvest practices	Australian Centre for International Agricultural Research, Australia	Jun 2010 - Nov 2012
General operation support for AVRDC in Africa	Bill & Melinda Gates Foundation, USA	Mar 2010 - Dec 2011
Vegetable breeding and seed systems for poverty reduction in Africa	Bill & Melinda Gates Foundation, USA	Dec 2006 - May 2011
Boosting competition ability of seed industry of Taiwan in Southeast Asia	Council of Agriculture, Taiwan	Jul 2010 - Jun 2011
Biodiversity Integration and Rural Development	Department of Animal and Human Biology, University of Torino, Italy	Oct 2009 - Oct 2012
Exploiting bittergourd (<i>Momordica charantia</i> L.) to increase incomes, manage type 2 diabetes, and promote health in developing countries	Deutsche Gesellschaft für Technische Zusammenarbeit, Germany	Mar 2011 - Feb 2014
Adoption pathways for vegetable integrated pest management technologies reducing pesticide use and pesticide related health hazards in India	Deutsche Gesellschaft für Technische Zusammenarbeit, Germany	Oct 2008 - Sept 2011
Less loss, more profit, better health: reducing the losses caused by the pod borer (<i>Maruca vitrata</i>) on vegetable legumes in Southeast Asia and sub-Saharan Africa by refining component technologies of a sustainable management strategy	Deutsche Gesellschaft für Internationale Zusammenarbeit, Germany	Apr 2010 - Mar 2013
Empowering youth through market-oriented vegetable production	Fintrac Inc., USA	Nov 2010 - Sep 2012
Regeneration and safeguard of valuable collections of vegetable germplasm held at the AVRDC - World Vegetable Center	Global Crop Diversity Trust, headquartered in Italy	Jul 2008 - Feb 2012
Indigenous African leafy vegetables for enhancing livelihood security of smallholder farmers in Kenya	Horticultural Collaborative Research Support Program, subcontracted under Purdue University, USA	Feb 2010 - Jan 2011
Sustainable production and marketing of vegetables in Central America	Horticultural Collaborative Research Support Program, subcontracted under the University of Wisconsin, USA	Feb 2010 - Jun 2011
Effect of shading and water management on three Southeast Asian indigenous vegetables	Japan International Research Center for Agricultural Sciences, Japan	Apr 2010 - Feb 2011
Screening for development of begomovirus-resistant processing tomato hybrid	Kagome Co. Ltd., Taiwan	Oct 2010 - Mar 2013
Screening for breeding of tomato late blight resistance	Known-You Seed Co. Ltd., Taiwan	Jan 2009 - Dec 2012
Characterize and map late blight resistance in wild tomato accessions	National Science Council, Taiwan	Aug 2010 - Jul 2013
Classification of Asian and African indigenous vegetables for anti-inflammatory and pro-resolution nature as determined by production of prostaglandin E2 and cyclooxygenase-2 in macrophage RAW 264.7	National Science Council, Taiwan	Aug 2009 - Jul 2011
Diagnosis and characterization of viruses infecting cucurbit crops in tropical Asia and identification of sources of virus resistance for use in the AVRDC's new cucurbit breeding program	National Science Council, Taiwan	May 2007 - Apr 2011
Identification of genetic determinants associated with virulence of <i>Ralstonia solanacearum</i> on a resistant tomato variety, Hawaii 7996	National Science Council, Taiwan	Aug 2009 - Jul 2012
Development of environmental friendly substances to control bacterial wilt and <i>Phytophthora</i> late blight of solanaceous crops	Rural Development Administration, South Korea	May 2010 - Dec 2012
Establishment of screening protocol for cucurbit downy mildew and powdery mildew resistance	Rural Development Administration, South Korea	Mar 2010 - Dec 2011
Multiplication and evaluation of tomato genetic resources for breeding for disease resistance and food-related functional traits	Rural Development Administration, South Korea	Mar 2010 - Dec 2011
Improving vegetable production and consumption for sustainable rural livelihoods in Jharkhand and Punjab, India	Sir Ratan Tata Trust, India	Apr 2008 - Mar 2013
Watermelon for life: the potential of African genetic resources	University of Copenhagen, Denmark	Dec 2009 - Mar 2011
Urbanization and its impacts on the use of natural resources in Africa	University of Freiburg, Germany	Sep 2009 - Aug 2012
Mobilizing vegetable genetic resources and technologies to enhance household nutrition, income and livelihoods in Indonesia	US Agency for International Development, Indonesia Mission	Jan 2011 - Dec 2014



AVRDC – The World Vegetable Center was traditionally discipline-based, focusing on a few principal crops. However, the Center’s mandate does not specify a set of core commodities, and its crop targets and disciplinary focus have changed in response to global needs.

As the only international center with “development” specifically in its name, AVRDC – The World Vegetable Center works throughout the research to development continuum, ensuring targeted, rigorous research to deliver new technologies, which are then adapted and tested with partners and disseminated to the end users. The Center has a diverse portfolio of projects and balance has to be retained between the research and development components to be able to ensure sustainable delivery of appropriate technologies, and thus to be able to create impact. The Center’s proportion of research activities compared with development activities remains fluid according to opportunities and needs, nevertheless AVRDC strives to ensure an effective balance between technology development and technology dissemination and uptake.

AVRDC – The World Vegetable Center focuses its research and development in four global themes: Germplasm, Breeding, Production, and Consumption. Multidisciplinary teams of scientists and support staff are deployed globally as needed to ensure the whole vegetable value chain is addressed and the needs of partners and stakeholders are taken into account.

The Center, while focused on vegetables, does not have a tightly defined crop species mandate. The flexibility allows AVRDC to adjust to local needs yet able to maintain a global view. The Center currently focuses on tomato, sweet and chili pepper, onion, some crucifers, cucumber, pumpkin and indigenous vegetables (especially African eggplant, bitter melon, slippery cabbage, okra, African nightshade, amaranth, moringa, sweet potato (leaves) and roselle).

The main research and development groups at the Center are in the following disciplines and groups: plant breeding (bulb alliums, cucurbits, legumes, pepper and tomato, and indigenous vegetables), plant pathology (bacteriology, mycology, and virology), entomology, biotechnology/molecular breeding, nutrition, socioeconomics, genetic resources and seed, and global technology dissemination. These are supported by biometrics, communications and information, information technology, human resources, grants and partnership development, intellectual property management, financial services, technical services, administrative services, and food and dormitory services. The diversity of skills and disciplines within the Center’s global geographic locations results in scientific teams that are flexible, innovative, able to address changing biotic and abiotic constraints of vegetable production, and which can respond rapidly to the consequences of economic and social change.

The following theme logframes provide a concise plan for each theme’s activities, outputs, and expected outcomes for 2011-2013 and serve as benchmarks for monitoring and evaluation.





Theme
GERMPLASM

Theme GERMPLASM: Germplasm conservation, evaluation and gene discovery

<p>Goal: Biodiversity of vegetable genetic resources is preserved and its utilization for food and nutritional security is enhanced</p>	<p>Purpose: Vegetable germplasm collected, conserved and distributed; the collection evaluated to identify those accessions with desirable traits, and their genes identified, characterized, and introgressed using classical and molecular technologies</p>
<p>Output 1: Vegetable genetic resources (including wild relatives, breeding materials, genetic stocks and populations) collected, conserved and distributed</p> <p>Outcome: Vegetable genetic resources preserved and made available globally for crop improvement</p>	
<p>Activity 1.1</p> <p>Collect/acquire and conserve vegetable and legume germplasm</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • 200 accessions collected/acquired at the Center’s headquarters • 90 accessions/breeding lines collected/acquired in sub-Saharan Africa for safety duplication in Regional Center for Africa <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • 200 accessions collected/acquired the Center’s headquarters • 90 accessions/breeding lines collected/acquired from hubs in SSA for safety duplication in Regional Center for Africa <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • 200 accessions collected/acquired the Center’s headquarters • 90 accessions/breeding lines collected/acquired from hubs in SSA for safety duplication in Regional Center for Africa

<p>Activity 1.2</p> <p>Maintain effective regeneration of priority vegetable germplasm</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • 1712 accessions regenerated at the Center’s headquarters: <i>Amaranthus</i> (66); <i>Brassica</i> (130); <i>Cleome</i> (55); <i>Corchorus</i> (30); <i>Cucumis</i> (30); <i>Cucurbita</i> (75), <i>Glycine</i> (200), <i>Hibiscus</i> (33); <i>Lablab</i> (43); <i>Momordica</i> (65); <i>Phaseolus</i> (72), <i>Raphanus</i> (30); <i>Solanum-eggplant</i> (343); <i>Solanum-tomato</i> (40); <i>Vigna</i> (500) • 500 accessions regenerated at Regional Center for Africa • Production and increase of good quality seed (18 crops for nutritional seed kit; advanced lines for multi-location and on-farm trials; maintenance of breeder materials) <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • 1505 accessions regenerated at the Center’s headquarters: <i>Abelmoschus</i> (52); <i>Allium</i> (30); <i>Amaranthus</i> (50); <i>Benincasa</i> (20); <i>Brassica</i> (130); <i>Capsicum</i> (64); <i>Cleome</i> (46); <i>Corchorus</i> (26); <i>Cucumis</i> (50); <i>Glycine</i> (230); <i>Lablab</i> (30); <i>Momordica</i> (30); <i>Moringa</i> (9); <i>Phaseolus</i> (65); <i>Raphanus</i> (8); <i>Solanum-eggplant</i> (260); <i>Solanum-tomato</i> (100); <i>Vigna</i> (300) • 500 accessions regenerated at Regional Center for Africa • Production and increase of good quality seed (18 crops for nutritional seed kit; advanced lines for multilocation and on-farm trials; maintenance of breeder materials) <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • 1500 accessions regenerated at the Center’s headquarters • 500 accessions regenerated at Regional Center for Africa
<p>Activity 1.3</p> <p>Distribute vegetable germplasm accessions and improved lines worldwide</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • 80% of vegetable germplasm requests served • 6,000 accessions/breeding lines distributed worldwide and to public or and private partners <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • 80% of vegetable germplasm requests served • 6,000 accessions/breeding lines distributed worldwide and to public and private partners <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • 80% of vegetable germplasm requests served • 6,000 accessions/breeding lines distributed worldwide and to public and private partners

<p>Activity 1.4</p> <p>Safety duplicate AVRDC - The World Vegetable Center's germplasm in other genebanks</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • 1500 accessions from the Center's headquarters duplicated at National Agrobiodiversity Center, Korea and Svalbard Global Seed Vault. • 300 accessions from Regional Center for Africaduplicated at the Center's headquarters and Svalbard Global Seed Vault. <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • 1500 accessions from the Center's headquarters duplicated at National Agrobiodiversity Center, Korea and Svalbard Global Seed Vault 300 accessions from Regional Center for Africaduplicated at the Center's headquarters and Svalbard Global Seed Vault <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • 1500 accessions from the Center's headquarters duplicated at National Agrobiodiversity Center, Korea and Svalbard Global Seed Vault • 300 accessions from Regional Center for Africaduplicated at the Center's headquarters and Svalbard Global Seed Vault
<p>Activity 1.5</p> <p>Systematically store information on conservation and distribution of vegetable germplasm in AVRDC- The World Vegetable Center's electronic databases</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • 100% of acquisition, regeneration and distribution data generated in 2010 entered into the Center's Vegetable Genetic Resources Information System (AVGRIS) and Regional Center for Africa's database • Characterization and evaluation data of 2009 available in AVGRIS and Regional Center for Africa's database <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • 100% of acquisition, regeneration and distribution data generated in 2011 entered into the Center's Vegetable Genetic Resources Information System (AVGRIS) and Regional Center for Africa's database Characterization and evaluation data of 2010 available in AVGRIS and Regional Center for Africa's database <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • 100% of acquisition, regeneration and distribution data generated in 2012 entered into the Center's Vegetable Genetic Resources Information System (AVGRIS) and Regional Center for Africa's database Characterization and evaluation data of 2011 available in AVGRIS and Regional Center for Africa's database
<p>Activity 1.6</p> <p>Develop strategies on in-situ conservation of indigenous vegetables</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Community-based conservation and multiplication of selected indigenous vegetables developed in Ocampo, Camarines Sur, Philippines

<p>Activity 1.7</p> <p>Develop effective seed health and quarantine program at AVRDC – The World Vegetable Center’s headquarters and the regional centers</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • All seed shipments from AVRDC - The World Vegetable Center comply with host country regulations • Seed detection methods for crucifer black rot pathogen compared and modified <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • All seed shipments from AVRDC - The World Vegetable Center comply with host country regulations • Efficiency of modified seed detection methods for crucifer black rot pathogen evaluated <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • All seed shipments from AVRDC - The World Vegetable Center comply with host country regulations
<p>Output 2: Germplasm characterized to enhance understanding and utilization of biodiversity in the vegetable germplasm collections</p> <p>Outcome: Genetic diversity of AVRDC – The World Vegetable Center germplasm collection determined and marker-trait associations identified</p>	
<p>Activity 2.1</p> <p>Characterize morphological traits of vegetable germplasm maintained at AVRDC and its Regional Centers</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • 1,100 accessions characterized at the Center’s headquarters • 200 accessions characterized at Regional Center for Africa based on standard morphological descriptors. • Seed of 50 Genebank’s <i>Cucurbita moschata</i> and 50 <i>Momordica charantia</i> accessions multiplied and preliminary evaluation completed • Seed of 50 Genebank’s <i>Momordica charantia</i> accessions multiplied and preliminary evaluation completed <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • 1,100 accessions characterized at the Center’s headquarters • 200 accessions characterized at Regional Center for Africa based on standard morphological descriptors. • Seed of 50 Genebank’s <i>C. moschata</i> and 50 <i>M. charantia</i> accessions multiplied and preliminary evaluation completed <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • 1,100 accessions characterized at the Center’s headquartersHQ • 200 accessions characterized at Regional Center for Africa based on standard morphological descriptors. • Seed of 50 Genebank’s <i>C. moschata</i> and 50 <i>M. charantia</i> accessions multiplied and preliminary evaluation completed

<p>Activity 2.2</p> <p>Conduct molecular characterization, genetic relationship and diversity analysis of germplasm collection</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Develop 150 SSR markers for <i>Momordica</i> • Develop 150 SSR markers for <i>Abelmoschus</i> <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Diversity analysis of <i>Abelmoschus</i> collection (~400 accessions) accomplished • Diversity analysis of <i>Momordica</i> (450 accessions) accomplished <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • <i>Momordica</i> association genetics panel established
<p>Activity 2.3</p> <p>Develop, characterize, and validate AVRDC germplasm core collections</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • African eggplant core collection initiated at Regional Center for Africa <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • <i>Abelmoschus</i> core collection initiated at the Center's headquarters <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • <i>Amaranthus</i> core collection initiated at Regional Center for Africa
<p>Activity 2.4</p> <p>Conduct association analysis to identify markers and genes linked to important agronomic traits</p>	<p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Association genetic analysis of <i>Solanum lycopersicum</i> for heat tolerance conducted <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • QTLs for heat tolerance elucidated

Output 3: Trait-based characterization and screening to enhance vegetable germplasm for effective use of important horticultural traits in the development of new vegetable cultivars

Outcome: Superior sources of genes for important horticultural traits identified

<p>Activity 3.1</p> <p>Identify and characterize sources of resistance to viral diseases</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Cucurbit germplasm screened for resistance to <i>Squash leaf curl Philippine virus</i> and <i>Papaya ringspot virus</i> – watermelon strain • Method for screening Solanaceous germplasm for resistance to <i>Pepper veinal mottle virus</i> –Taiwan isolate developed. • Taiwan isolates of Solanaceae-infecting tospoviruses characterized and assessed for use in screening Solanaceous germplasm for resistance. <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Tomato and pepper germplasm screened for resistance to <i>Pepper veinal mottle virus</i> –Taiwan isolate and Taiwan isolates of Solanaceae-infecting tospoviruses. • Cucurbit germplasm screened for resistance to <i>Squash leaf curl Philippine virus</i> – Taiwan isolate. • Method for screening cucurbit germplasm for resistance to one cucurbit-infecting polerovirus using infectious clones developed <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Tomato and pepper germplasm screened for resistance to <i>Pepper veinal mottle virus</i> –Taiwan isolate and <i>Capsicum chlorosis virus</i> – Taiwan isolate. • Cucurbit germplasm screened for resistance to one cucurbit-infecting polerovirus
<p>Activity 3.2</p> <p>Identify and characterize sources of resistance to fungal and bacterial diseases</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Pepper accessions screened for resistance to anthracnose and <i>Phytophthora</i> blight • Tomato accessions screened for late blight resistance • Cucurbit accessions screened for powdery mildew resistance <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Pepper accessions screened for resistance to anthracnose and <i>Phytophthora</i> blight • Tomato accessions screened for late blight resistance • Cucurbit accessions screened for powdery mildew resistance <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Pepper accessions screened for resistance to anthracnose and <i>Phytophthora</i> blight • Tomato accessions screened for late blight resistance • Cucurbit accessions screened for powdery mildew resistance

<p>Activity 3.3</p> <p>Identify and characterize sources of resistance to insect pests</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Pepper, tomato, radish and okra accessions screened for resistance to sucking insects and broad mites, red spider mite, striped flea beetle and aphid, respectively • Eggplant accessions confirmed for their resistance to thrips <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Mechanisms and bases of resistance to sucking insects and broad mites in selected pepper accessions characterized • Okra accessions confirmed for their resistance to aphid • Bitter gourd accessions screened for resistance to melon fly <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Mechanisms and bases of resistance to aphid in selected okra accessions characterized • Pumpkin accessions screened for resistance to aphid • Tomato accessions screened for resistance to thrips
<p>Activity 3.4</p> <p>Identify and characterize sources of tolerance to drought, heat, flooding and salinity stress</p>	<p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Molecular markers for heat tolerance developed and validated
<p>Activity 3.5</p> <p>Evaluate vegetable germplasm for selected nutrition-related compounds</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • List of anti-inflammatory phytonutrients developed for more than 50 indigenous vegetables • Major/targeted phytochemicals in commonly consumed vegetables identified • Profile and content variation of anti-diabetic compounds in bitter gourd germplasm determined <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • LC-MS profiles of non-targeted phytochemicals of commonly consumed vegetables determined • Profile and content variation of anti-diabetic compounds of promising bitter gourd germplasm determined <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Metabolome databases of commonly consumed vegetables developed • Profile and content variation of anti-diabetic compounds of promising bitter gourd germplasm for India and Tanzania determined
<p>Output 4: Specialized genetic materials, molecular tools, and methods developed to enable the development of new varieties more rapidly</p> <p>Outcome: Genes conferring improved horticultural traits introgressed, genetically mapped, and DNA markers developed for marker-assisted selection</p>	

<p>Activity 4.1</p> <p>Develop mapping populations and identify QTLs for resistance to biotic stresses</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Tomato genes associated with resistance to <i>Tomato yellow leaf curl virus</i> and bacterial wilt mapped <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Tomato genes associated with resistance to late blight mapped • Double-haploid technology for rapid production of mapping populations in solanaceous crops developed <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Begomovirus resistance identified in Capsicums and mungbean
<p>Activity 4.2</p> <p>Develop mapping populations and identify QTLs for tolerance to abiotic stresses</p>	<p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Tomato genes associated with drought and heat tolerance mapped
<p>Activity 4.3</p> <p>Conduct fine mapping of QTLs and develop markers for marker-assisted selection (MAS)</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Efficiency of MAS for selecting bacterial wilt QTL on chromosome 12 in Hawaii 7996 determined
<p>Activity 4.4</p> <p>Assemble and develop molecular marker sets for priority vegetable crops</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • 100 markers for tomato developed/assembled • 300 markers for pepper developed/assembled <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • 100 markers for tomato developed/assembled • 200 markers for pepper developed/assembled
<p>Output 5: Genes affecting important horticultural traits isolated, validated, and functionally analyzed using genomics and molecular technologies</p> <p>Outcome: Gene markers associated with important horticultural traits developed and transgenic vegetables with enhanced characteristics generated where appropriate</p>	
<p>Activity 5.1</p> <p>Allele mining to identify variation conferring superior traits</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Allelic variation for critical genes associated with drought and heat tolerance in tomato determined <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Allelic variation between heat susceptible and tolerant tomato determined
<p>Activity 5.2</p> <p>Characterize and validate candidate genes for heat and drought tolerance</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Critical candidate genes for heat tolerance validated and prioritized.

<p>Activity 5.3</p> <p>Evaluate gene function and efficacy through genetic engineering</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • RNAi constructs containing <i>Tomato yellow leaf curl virus</i> intergenic region and fragments from multiple strains developed • RNAi tomato events generated <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • RNAi events evaluated for non-strain specific resistance to <i>Tomato yellow leaf curl virus</i> • Transgenic tomato plants expressing candidate genes for bacterial wilt resistance generated
<p>Output 6: Intellectual Property Rights strategy on germplasm, transgenics and genes implemented</p> <p>Outcome: AVRDC – The World Vegetable Center, national agricultural research and extension systems and the private sector benefit from using the Center’s germplasm collection and improved breeding lines</p>	
<p>Activity 6.1</p> <p>Utilize, develop or improve Material Transfer Agreements (MTAs) for genebank germplasm, breeding lines and transgenic materials that support AVRDC’s interests</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • All outgoing seed shipments comply with Center’s MTAs • Incoming seed are accompanied by MTA or germplasm acquisition agreement <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • All outgoing seed shipments comply with Center’s MTAs • Incoming seed are accompanied by MTA or germplasm acquisition agreement <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • All outgoing seed shipments comply with Center’s MTAs • Incoming seed are accompanied by MTA or germplasm acquisition agreement
<p>Output 7: Capacity in germplasm conservation, evaluation, characterization, and gene discovery developed</p> <p>Outcome: Skills of national agricultural research and extension systems’ scientists in germplasm conservation, utilization and gene discovery enhanced</p>	
<p>Activity 7.1</p> <p>Train human resources in vegetable genetic resources conservation, management, and evaluation using conventional and advanced techniques</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Training on germplasm conservation and management conducted • Training on use of molecular tools for biodiversity analysis and germplasm evaluation conducted <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Training on germplasm conservation and management conducted • Training on use of molecular tools for biodiversity analysis and germplasm evaluation conducted <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Training on germplasm conservation and management conducted • Training on use of molecular tools for biodiversity analysis and germplasm evaluation conducted



Notre Passion Votre Plaisir

Theme
BREEDING

Theme BREEDING: Genetic enhancement and varietal development of vegetables

<p>Goal: Varieties with potential to expand opportunities in tropical vegetable production</p>	<p>Purpose: Farmers obtain varieties and lines of major vegetables that produce high yields of nutritious and marketable food with less health risk and environmental damage</p>
<p>Output 1: Varieties and lines of vegetables with improved disease resistance, stress tolerance, quality and nutritional traits developed</p> <p>Outcome: Lines adopted directly as varieties or used in public/private sector breeding programs</p>	
<p>Activity 1.1</p> <p>Develop heat tolerant and disease-resistant tropical tomato with desirable horticultural and quality traits</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Fresh market/dual purpose lines with various combinations of resistances to begomoviruses, bacterial wilt, fusarium wilt, early blight superior horticultural and nutritional content developed and distributed • 10-15 fresh market tomato lines with <i>Ty-3</i> and multiple late blight resistance (<i>Ph-2+Ph-3</i>) advanced to F_7 generation and 2-5 F_7 lines developed via marker-assisted selection (MAS) homozygous for <i>Mi-1</i> and <i>Ty-3</i> genes conferring resistances to root-knot nematode and TYLCVD resistance • 5-10 F_4 lines selected for adaptation to West Africa, including disease resistance, rainy season tolerance and good fruit quality • Baseline survey data on preferences and cropping patterns among tomato growers in Karnal, Haryana analyzed and results documented <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Distribution of fresh market tomato F_7 lines with <i>Ty-3</i> and multiple late blight resistance (<i>Ph-2+Ph-3</i>) • Fresh market/dual purpose lines with begomovirus resistance genes <i>Ty-5</i> or <i>Ty-3a</i> and bacterial wilt, early blight and horticultural traits • 2 tomato lines with TYLCD resistance and good horticultural traits identified for release in Mali/West Africa • High flavonoid QTL fine-mapped and high flavonoid tomato lines developed <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Marker-assisted selection conducted to combine acylsugar insect resistance and <i>Ty-3</i> begomovirus resistance • 3-5 high lycopene/carotenoid (high pigment and crimson genes) developed via MAS

<p>Activity 1.2</p> <p>Develop and distribute disease-resistant chili and sweet pepper varieties (targeting anthracnose, <i>Phytophthora</i>, bacterial wilt, <i>Cucumber mosaic virus</i>, <i>Chilli veinal mottle virus</i>, and/or begomoviruses)</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • 1-4 advanced lines carrying resistance to two or more diseases developed • Seed of 10-15 new lines distributed through the International Chili Pepper Nursery and/or International Sweet Pepper Nursery • Seeds of 5-10 promising pepper lines increased for use in breeding program, or for direct release after further evaluation in Taiwan and/or Southeast Asia, or other regions • Develop populations to determine inheritance of insect resistance; advance selections <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • 1-4 advanced lines carrying resistance to two or more diseases developed • Seed of 7-12 new lines distributed through the International Chili Pepper Nursery and/or International Sweet Pepper Nursery • Seeds of 5-10 promising pepper lines increased for use in breeding program, or for direct release after further evaluation in Taiwan, Southeast Asia, or other regions • Select promising progenies displaying resistance to aphids, mites, and/or thrips <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • 1-4 advanced lines carrying resistance to two or more diseases developed • Seed of 7-12 new lines distributed through the International Chili Pepper Nursery and/or International Sweet Pepper Nursery • Seeds of 5-10 promising pepper lines increased for use in breeding program, or for direct release after further evaluation in Taiwan, Southeast Asia, or other regions • Select advanced lines with resistance to aphid, mites and/or thrips
<p>Activity 1.3</p> <p>Develop heat tolerant tropical sweet pepper</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Test hybrid combinations and promising lines evaluated and multiplied • Mechanisms and markers for heat tolerance utilized in selection methodologies <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Test hybrids and promising lines evaluated and seed multiplied • Mechanisms and markers for heat tolerance utilized in selection methodologies <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • 5-10 promising pepper lines increased for use in breeding programs, or for direct release after further evaluation in Mali

<p>Activity 1.4 Develop short-day red onions and yellow onions for improved yield, extended shelf-life, and/or <i>Stemphylium</i> resistance</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • AVRDC onion breeding strategy document prepared • Ambient- and cold-storage facilities established in Mali for storing onions during hot summer months and net cages for seed production constructed in Mali • Introduced open-pollinated onion lines evaluated for adaptation in Mali and backcrossed and recombined progenies evaluated for bulbing, <i>Stemphylium</i> resistance, and seed productivity • Bulk seed multiplication of backlog AVRDC onion lines outsourced to contractors and seeds of 5 F₇ and 3 F₆ onion promising lines (high yield, early and long-self) increased for multi local trials in West and East Africa <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Final seed production of onion lines at the Center's headquartered; operations phased out • Seed increase of 2-5 open pollinated lines for multilocation trials in West and East Africa or other regions and bulk seed production of uniform varieties from the Center's headquarters and Mali reselections • Bulbs of 2-4 recombined lines for high yield, high dry matter content, early maturity produced in Mali • Seed of 1-2 selections of 'Violet de Galmi,' 'Redbone,' and/or 'Bombay Red' produced for promotional trials in West and East Africa <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Seed of 2-4 recombined varieties increased for further evaluation for yield, storage and maturity in West and East Africa • Selected populations of AVRDC lines and reselections from 'Violet de Galmi,' 'Redbone,' and/or 'Bombay Red' evaluated in promotional trials in West and East Africa
<p>Activity 1.5 Develop heat-tolerant broccoli hybrids</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Broccoli hybrids evaluated for heat tolerance and quality traits in Taiwan summer <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Broccoli hybrids evaluated for heat tolerance and quality traits in Taiwan summer <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Heat tolerant broccoli hybrid seed multiplied for distribution/ multilocation trials

<p>Activity 1.6</p> <p>Develop improved vegetable soybean and mungbean with improved nutritional and flavor qualities</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Seed of basmati and super-nodulating vegetable soybean lines multiplied and distributed at Regional Center for South Asia • New interspecific crosses to introgress high methionine from blackgram to mungbean conducted • Identification of mungbean lines with resistance to <i>Mungbean yellow mosaic virus</i> evaluated at two hot spots <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Vegetable soybean lines promoted in India • Backcrosses to introgress high methionine trait into mungbean carried out • Mungbean mapping populations developed for <i>Mungbean yellow mosaic virus</i> resistance • Identification of mungbean lines with superior sprouting ability compared to commercial checks <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Testing of improved mungbean lines for methionine content by HPLC method conducted • Markers for <i>Mungbean yellow mosaic virus</i> resistance in mungbean developed • Mungbean lines with high yield potential, earliness, bruchid and <i>Mungbean yellow mosaic virus</i> resistance developed
<p>Activity 1.7</p> <p>Develop cucumber lines for improved horticultural traits, disease resistance, good fruit quality, and high gynoecy</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • 100-150 F₆ families of bitter-free and high femaleness of South and Southeast Asian types evaluated and advanced • 80-100 F₅ families of bitter-free and high femaleness of South and Southeast Asian types developed from fifteen elite varieties, evaluated and advanced <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • 60-80 F₇ lines of bitter-free and high femaleness of South and Southeast Asian types evaluated • 20-40 F₆ families of bitter free and high femaleness of South and Southeast Asian type developed from fifteen commercial varieties, evaluated and advanced <p><i>Output Target 2013</i></p> <ul style="list-style-type: none"> • 10-15 F₇ entries evaluated in replicated trial and characterized for key horticultural traits and disease resistance • 20-30 hybrid combinations of South and Southeast Asian types evaluated in targeted countries along with 5-8 improved inbreds

Activity 1.8

Develop disease resistant and high quality pumpkins (*Cucurbita moschata*)

Output Targets 2011

- 30-40 F₅ families evaluated and advanced for yield, fruit quality and field resistance to diseases
- *Zucchini yellow mosaic virus*- resistant *C. moschata* BC₄S₁ and BC₅ populations evaluated and advanced
- Seeds of 50 Genebank's pumpkin accessions multiplied and their preliminary evaluation completed
- Selected elite hybrids evaluated and selfed; 250 F₂ plants evaluated and their generations advanced

Output Targets 2012

- 20-35 F₆ families evaluated and advanced for yield, fruit quality and field resistance to diseases
- *Zucchini yellow mosaic virus* resistant *C. moschata* BC₆S₁ populations evaluated and advanced
- Seeds of 50 Genebank's pumpkin accessions multiplied and their preliminary evaluation completed
- 50-80 F₃ and 40-60 F₄ families derived from selected elite hybrids evaluated and their generations advanced

Output Targets 2013

- 15-20 F₇ entries evaluated in replicated trials and characterized for key horticultural traits and nutritional components and field resistance to diseases
- BC₆S₁ Local Papaya used as *Zucchini yellow mosaic virus* resistant *C. moschata* donor parent and crossed to varieties representing three market types (China, Southeast Asia, India) to develop 15-20 F₁s, for evaluation in target countries
- Seeds of 50 Genebank's pumpkin accessions multiplied and preliminary evaluation completed
- 30-50 F₅ families derived from elite hybrids evaluated and advanced to F₆ and 25-30 F₆ families evaluated and advanced

<p>Activity 1.9</p> <p>Develop bitter gourd lines/hybrids with improved yield, earliness, good fruit quality and resistance to diseases/insects</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Seeds of 50 Genebank's bitter gourd accessions multiplied and preliminary evaluation completed • 350 F₂ plants and 40-50 F₃ families derived from elite hybrids evaluated and advanced • Multi-locational trials of elite bittergourd germplasm and commercial lines in India, Tanzania and Taiwan conducted to evaluate environment, ripening stage, local postharvest management on level of nutrients and anti-diabetic compounds in bittergourd <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Seeds of 50 Genebank's bitter gourd accessions multiplied and preliminary evaluation completed • 70-100 F₄ and 50-70 F₅ families derived from elite hybrids evaluated and advanced • Multi-locational trials of elite bittergourd germplasm and commercial lines in India, Tanzania and Taiwan conducted to evaluate environment, ripening stage, local postharvest management on level of nutrients and anti-diabetic compounds in bittergourd <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Seeds of 50 Genebank's bitter gourd accessions multiplied and preliminary evaluation completed • 40-50 F₆ families derived from elite hybrids evaluated and advanced and a set of 30-40 F₇ lines evaluated in replicated trial • Multi-locational trials of elite bittergourd germplasm and commercial lines in India, Tanzania and Taiwan conducted to evaluate environment, ripening stage, local postharvest management on level of nutrients and anti-diabetic compounds in bittergourd
<p>Output 2: Indigenous vegetables improved for productivity, quality, and nutrient content</p> <p>Outcome: Lines potentially beneficial to farmers and consumers</p>	
<p>Activity 2.1</p> <p>Develop African indigenous vegetables with superior horticultural traits</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Multilocal trial data of African eggplant, African nightshade, Ethiopian mustard and Amaranth collected and analyzed <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Promising lines of African eggplant and amaranth evaluated for horticultural traits and organoleptic/nutritional qualities <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Promising lines of African eggplant and amaranth evaluated for horticultural traits and organoleptic/nutritional qualities

<p>Activity 2.2</p> <p>Evaluation, seed multiplication, and distribution of elite African and Asian indigenous vegetables</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • 2-3 varieties of African eggplant, African nightshade, Ethiopian mustard and Amaranth submitted for official release in Tanzania and the seed shared out with partners <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Seed of 2-5 lines of Amaranth and roselle with good horticultural traits and organoleptic quality increased and promoted; and 3-6 African eggplant lines evaluated in multilocation trials and selected lines increased for direct release or for use in breeding programs • Elite African and Asian indigenous vegetables evaluated for horticultural, nutritional, and anti-nutritional traits and seed of selected lines/accessions increased for international distribution <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Elite African and Asian indigenous vegetables evaluated for horticultural, nutritional, and anti-nutritional traits and seed of selected lines/accessions increased for international distribution
<p>Activity 2.3</p> <p>Okra breeding for West Africa</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Source/s of resistance to root knot nematode identified and utilized in crossing program • Sterility in interspecific hybrids (<i>A. esculentus</i> x <i>A. caillei</i>) studied and strategies proposed to overcome hybrid barriers • Selection and generation advance among and within crosses of 'local by improved lines' carried out • Preliminary studies on okra mucilage conducted, locally adapted lines shared between Mali and Niger, feedback obtained and seeds multiplied on-farm • Farmer participatory trials conducted with locally adapted lines and seeds multiplied on-farm <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Inheritance of resistance to nematode studied and informative markers identified • Selection for fertility and other traits in segregating <i>A. esculentus</i> x <i>A. caillei</i> conducted and generation advanced • Regenerated Mali accessions purified and promising lines evaluated for horticultural traits, organoleptic characters and processing quality <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • 5-8 purified lines evaluated in multilocation trials and selected lines increased for direct release or for use in breeding programs
<p>Output 3: Vegetable variety testing networks and improved seed systems developed</p> <p>Outcome: Improved distribution, evaluation, release, and seed production of AVRDC-bred varieties leading to (1) better understanding of genotype-environment interactions, (2) traits critical for particular agroecosystems and markets (3) streamlined variety release procedures, and (4) more efficient vegetable seed production</p>	

<p>Activity 3.1</p> <p>Assemble and distribute international/regional vegetable nurseries and promising lines</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Global distribution and testing of international chili pepper, sweet pepper, tomato, and leafy crucifer nurseries and other AVRDC-developed lines conducted • International and regional indigenous vegetable nurseries assembled for distribution and promotion <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Global distribution and testing of international chili pepper, sweet pepper, tomato, and leafy crucifer nurseries and other AVRDC developed lines continued • International and regional indigenous vegetable nurseries assembled for distribution and promotion • International yield nurseries of cucurbits and tomato abiotic stress nursery (heat tolerance, salt tolerance) organized and distributed <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Global distribution and testing of international chili pepper, sweet pepper, tomato, vegetable soybean and mungbean nurseries and other AVRDC developed lines conducted
<p>Activity 3.2</p> <p>Analyze and review of multi-environment testing of AVRDC – The World Vegetable Center’s improved germplasm</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Multilocation trials of African eggplant, amaranth, roselle, okra in Mali analyzed and summarized • Vegetable variety trials and implications for breeding and variety release analyzed and summarized • 1-2 fresh market/dual purpose lines with combinations of resistances to early blight, late blight and superior horticultural traits tested for adaptation to East African and submitted for official release in Tanzania <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Results of multi-location testing of tomato, sweet pepper, chili lines in Central America analyzed and implications for breeding assessed • Vegetable variety trials and implications for breeding and variety release analyzed and summarized <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Vegetable variety trials and implications for breeding and variety release analyzed and summarized
<p>Activity 3.3</p> <p>Develop on-line seed request database to facilitate seed requests for AVRDC – The World Vegetable Center’s improved vegetables</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • On-line databases for tomato, pepper, and root stocks updated • On-line databases for leafy crucifers and selected indigenous vegetables developed <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • At least 75% of seed requests for AVRDC – The World Vegetable Center’s improved vegetables are done on-line • On-line database for okra developed <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • On-line databases for cucurbits, onions developed

<p>Activity 3.4</p> <p>Improvement of seed systems</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Variety release and registration procedures harmonized for Tanzania and neighboring countries • Locally adapted 2-3 popular open pollinated improved varieties catalogued in Niger Ministry of Agriculture • Locally adapted popular open pollinated improved varieties catalogued, at least 10 in Mali, at least 15 in Cameroon and at least 10 in Madagascar • Locally adapted 4-6 popular open pollinated varieties released in Tanzania • Commercial seeds of newly developed AVRDC-derived varieties produced and distributed by at least one seed company in Tanzania, Cameroon, Mali and neighboring countries <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Commercialization of newly developed AVRDC varieties by seed companies in Tanzania, Cameroon, Mali and neighboring countries <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Commercialization of newly developed AVRDC varieties by seed companies in Tanzania, Cameroon, Mali and neighboring countries
<p>Activity 3.5</p> <p>Male sterility to improve the efficiency of hybrid vegetable seed production</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Cytoplasmic male sterility (CMS) versions of additional elite chili and sweet pepper lines developed • Development of Sweet Pepper restorers using hot pepper restorer gene from 'Susan's Joy' initiated <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • CMS and maintainer versions of 'Jupiter' sweet pepper established • CMS versions of additional elite chili and sweet pepper lines developed <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Molecular markers for CMS cytoplasm and nuclear factors utilized in backcrossing activities • CMS versions of additional elite chili and sweet pepper lines developed



Theme
PRODUCTION

Theme PRODUCTION: Safer and sustainable vegetable production systems

<p>Goal: Substantial contributions to safer and sustainable vegetable production generated</p>	<p>Purpose: Increased supply of safer vegetables through adoption of profitable, environmentally sound practices by farmers leading to knowledge-based farming</p>
<p>Output 1: Integrated pest management technologies developed/validated</p> <p>Outcome: Integrated pest management technologies and related information to manage major vegetable pests ready to be disseminated to national agricultural research and extension systems, nongovernmental organizations, and small-scale farmers</p>	
<p>Activity 1.1</p> <p>Diagnose and characterize major insect pests</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Species identity and phylogenetic relationship of the genus <i>Maruca</i> occurring on vegetable legumes in South Asia, Southeast Asia and sub-Saharan Africa established <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Association of molecular variations in <i>Maruca</i> populations with host plants and geographical origins in South Asia, Southeast Asia and sub-Saharan Africa determined • Most common species of thrips vectors associated with tospovirus hotspots in South Asia and Southeast Asia catalogued <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Phylogenetic relationship of eggplant fruit and shoot borer in Southeast Asia and South Asia established

<p>Activity 1.2</p> <p>Develop integrated pest management technologies for major insect pests</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Major natural enemies of legume pod borer identified in Southeast Asia and parasitism of major parasitoids on legume pod borer determined • Control efficacy of bio-pesticides against legume pod borer determined in Southeast Asia and sub-Saharan Africa • Effects of various irrigation practices on the incidences of insect pests on onion confirmed. <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Most effective sex pheromone blends against legume pod borer in Southeast Asia and sub-Saharan Africa identified • Integrated pest management strategy based on sex pheromone, bio-pesticides and parasitoids for legume pod borer validated in Southeast Asia and sub-Saharan Africa • Epidemiology of thrips vectors transmitting tospoviruses in vegetable cropping systems established <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Efficacy of biological control practices to manage diamondback moth and cabbage web worm on vegetable brassicas determined in West Africa (Benin, Cameroon and Ghana) • Efficacy of integrated pest management practices to manage striped flea beetle on vegetable brassicas determined in Southeast Asia • Heat tolerant larval and pupal parasitoids of diamondback moth identified in West Asia • Integrated pest management strategy for thrips vectors transmitting tospoviruses and spider mite developed
<p>Activity 1.3</p> <p>Diagnose, characterize and develop integrated management strategies for major bacterial diseases</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Molecular markers associated with virulence of phylotype I strains of <i>Ralstonia solanacearum</i> on tomato developed • Race 3 strains isolated from potato in Taiwan characterized • Effect of rice husk biochar on induced resistance evaluated <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Usefulness of molecular markers associated with virulence of phylotype I strains of <i>R. solanacearum</i> on tomato in strain profiling determined • Virulence of race 3 strains of <i>R. solanacearum</i> on tomato evaluated • Efficacy of biochar and other biological control agents in controlling tomato bacterial diseases evaluated <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Efficacy of biochar and other biological control agents in controlling major vegetable bacterial diseases evaluated

<p>Activity 1.4</p> <p>Diagnose, characterize and develop integrated management technologies for major fungal diseases</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Phylogenetic relationship and genetic diversity of <i>Colletotrichum acutatum</i> affecting pepper in Taiwan determined • Spatial and temporal distribution of <i>C. acutatum</i> pathotypes causing pepper anthracnose in Taiwan determined • Efficacy of biopesticides and cultural practices in controlling tomato fungal diseases, especially late blight evaluated for tomato <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Taxonomic status of <i>Colletotrichum</i> species associated with pepper anthracnose in Taiwan determined • Efficacy of biopesticides and cultural practices in controlling tomato fungal diseases, especially late blight evaluated for tomato on-farm <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Efficacy of biopesticides and cultural practices in controlling major vegetable fungal diseases evaluated
<p>Activity 1.5</p> <p>Detect, characterize and explore integrated management strategies for major viral diseases</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • The important viruses, especially begomoviruses infecting <i>Solanaceae</i>, <i>Cucurbitaceae</i> and <i>Leguminaceae</i> crops in Asia and Africa identified and monitored • Cucurbit, tomato, legume and pepper-infecting begomoviruses in Taiwan, Indonesia and/or Thailand characterized • Full-length clone of cucurbit-infecting polerovirus in Taiwan developed and genetic diversity of poleroviruses in Asia studied <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • The important viruses, especially begomoviruses infecting <i>Solanaceae</i>, <i>Cucurbitaceae</i> and <i>Leguminaceae</i> crops in Asia and Africa characterized and monitored • Genetic diversity of cucurbit-infecting begomoviruses in Taiwan studied • Infectious clone of cucurbit begomovirus from Taiwan developed <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • The important viruses, especially begomoviruses infecting <i>Solanaceae</i>, <i>Cucurbitaceae</i> and <i>Leguminaceae</i> crops in Asia and Africa characterized and monitored • Genetic diversity of <i>Chilli veinal mottle virus</i> and <i>Pepper veinal mottle virus</i> in Taiwan studied

Output 2: Integrated crop and soil fertility management technologies developed/validated

Outcome: Integrated crop and soil fertility management technologies and related information to enhance and sustain vegetable productivity ready to be disseminated to NARES, NGOs, and small-scale farmers

<p>Activity 2.1</p> <p>Develop technologies to improve soil nutrient use efficiency and soil sustainability</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Simple, quick testing kits for determining nitrate and potassium in petiole sap of selected vegetables developed • Simple methods for assessing soil health in vegetable field reviewed and summarized <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Protocol for application of biochar in vegetable production developed and effects of biochar application on selected vegetables tested • Effects of biochar application on selected vegetables in different site verified • Effects of rhizosphere-soil management packet on selected vegetables tested <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Effects of rhizosphere-soil management packet on selected vegetables in different sites validated • Effects of biochar application on composting and soil properties improvement tested
<p>Output 3: Improved vegetable production technologies integrated, disseminated, and impact assessed</p> <p>Outcome: Farmers adopt new technologies that result in improved farm productivity and sustainability, incomes, and farm livelihoods</p>	
<p>Activity 3.1</p> <p>Identify major constraints and determine site-specific dissemination strategies in targeted regions</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • A check-list for implementing technology dissemination project effectively developed • Participatory appraisals of vegetable farming conducted in low/high-input areas of targeted countries, and dissemination strategies determined for integrated crop management technologies <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Participatory appraisals of vegetable farming conducted in low/high-input areas of targeted countries, and dissemination strategies determined for integrated crop management technologies • Major insect and mite pests on mungbean and vegetable soybean in humid-tropics and semi-arid areas of South Asia identified <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Participatory appraisals of vegetable farming conducted in low/high-input areas of targeted countries, and dissemination strategies determined for integrated crop management technologies • Major insect and mite pests on indigenous vegetables (African eggplant, African nightshade, amaranth, Ethiopian mustard, spider plant and okra) in sub-Saharan Africa identified • Major insect and mite pests on selected vegetables in Central and West Asia identified

<p>Activity 3.2</p> <p>Adapt integrated production technologies for targeted systems or regions</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Integrated pest management packages for cucumber, eggplant, okra, sweet pepper and tomato under net-house production systems in Punjab, India and for bottle gourd and okra under open-field production systems in Jharkhand, India validated • Improved vegetable production technologies (e.g. composting, balanced fertilization technology and adaptation of mungbean and soybean rotations) adapted in Jharkhand and Punjab India • Simple and low-cost drip irrigation technology validated in Solomon Islands <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Integrated pest management packages for target crops under open-field and net-house production systems in Jharkhand and Punjab India adopted • Improved vegetable production technologies (e.g. composting, balanced fertilization technology and adaptation of mungbean and soybean rotations) adapted in Jharkhand and Punjab India • Adoption of integrated pest management strategy and reduction in pesticide residue levels in eggplant determined in South Asia <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Integrated pest management packages for mungbean and vegetable soybean in humid-tropics and semi-arid areas of South Asia validated • Integrated pest management strategy for eggplant fruit and shoot borer in Southeast Asia adopted
<p>Activity 3.3</p> <p>Strengthen capacity of local partners and farmers to promote technology adoption</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Integrated vegetable production technologies disseminated to NARES/NGOs and farmers in collaboration with local partners in India and the Solomon Islands • Extension and training materials published on various vegetable production technologies and Training of Trainers and mature technologies on AVRDC website updated • A framework for the Center's training evaluation activities developed and related database and evaluation updated <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Extension and training materials published on various vegetable production technologies and mature technologies on AVRDC website updated • Manual for the evaluation of trainings available on-line for AVRDC use with links to example tools for evaluation <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Extension and training materials published on various vegetable production technologies and mature technologies on AVRDC website updated • Integrated vegetable production technologies disseminated in Asia and Africa • Training courses of AVRDC compared and recommendations for the optimization of efficiency and cost effectiveness developed

<p>Activity 3.4</p> <p>Understand farmers' behavior, cost-benefit, and constraints/opportunities of technology adoption</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Costs and benefits and constraints on adoption of microirrigation technologies analyzed and documented for selected countries in West Africa, and in tropical Asia • Level of pesticide use and other plant protection measures adopted to control pod borer on yard-long bean in Thailand and Vietnam analyzed and documented • Costs and benefits of various crop management technologies for vegetables in Solomon Islands analyzed and recommendations developed for 'best practices' • Develop guidelines for pre-testing of newly developed extension material <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Economic analysis of selected improved vegetable production technologies in Cambodia analyzed and documented • Impacts of IPM practices for eggplant in selected countries of South Asia analyzed and documented • Validate guideline for pre-testing of newly developed extension material <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Economic value of the major non-market goods and services of integrated pest management uses (at farmers' level) in selected parts of South Asia analyzed and documented
<p>Activity 3.5</p> <p>Understand the impact of improved technologies on production systems and livelihoods</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Socioeconomic impacts of affordable microirrigation technologies on vegetable farming in selected countries of Western Africa analyzed • Preliminary impact assessment of introduced technologies on vegetable production in Solomon Islands documented <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Performance and impacts of private extension agents on transfer of technology to vegetable farmers in Cambodia analyzed and evaluated • Economic and social impact of integrated pest management technologies for eggplant production in selected countries of South Asia assessed and documented <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Economic value and policy implications of wider economic and social impacts of integrated pest management practices for eggplant in selected countries of South Asia analyzed and documented • Economic implications and impacts of ecosystem services generated from peri-urban vegetable production systems in selected countries of South Asia characterized and analyzed • Adoption of improved vegetable production under net house in Punjab and open field conditions in Jharkhand on commercialization and farmer's income documented





Theme
CONSUMPTION

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

<p>Goal: Consumer health improved by increased consumption of nutritious vegetables for a balanced diet</p>	<p>Purpose: Increased public awareness, accessibility and utilization of nutritious and diverse vegetables</p>
<p>Output 1 : Knowledge of consumer behavior and nutritional properties of vegetables enhanced</p> <p>Outcome: Research communities become aware and better understand consumers' attitude towards health, food safety and vegetable consumption as well as the nutritional and functional values of vegetables.</p>	
<p>Activity 1.1</p> <p>Assess consumption nutrition related outcomes of vegetable gardeners and consumers in Asia and Africa</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Midterm monitoring for nutritional and socio-economic impact of home garden practices on village members in Punjab and Jharkhand conducted • Baseline survey on bitter gourd production, marketing and consumption in India and Tanzania conducted • Baseline information on market oriented youth empowerment vegetable production and consumption collected <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Baseline survey report on bitter gourd production, marketing and consumption in India and Tanzania completed • Consumption, nutritional and socioeconomic outcomes at household levels in Bamako, Kita, Guene, and Kirina in Mali evaluated <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Ex-ante analysis of production and consumption of bittergourd in India and Tanzania for diabetes conducted • Impact assessment of the utilization outcomes of market oriented vegetable production and consumption training program for youth empowerment in Tanzania conducted

<p>Activity 1.2</p> <p>Study nutritional and functional values and benefits of vegetables from tropical Africa and Asia</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Literature on phytonutrients in leafy solanaceous crops (nightshade and eggplant) and their potential positive and negative health benefits reviewed and documented • Anti Oxidant Analog activity of selected Southeast Asian indigenous vegetables evaluated • Nutritional values of vegetables commonly consumed in Bamako, Kita, Guene, and Kirina evaluated • Optimal preparation method and dosage determined for using bitter gourd in ameliorating effects of diabetes investigated in animal model • Association of phytochemicals in selected vegetables with metabolites in animal cells and anti-inflammatory properties investigated <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Information on anti-and pro-inflammation properties of selected indigenous vegetables published and potential food intervention approach identified to enhance immune function • Optimal preparation method and dosage determined for using bitter gourd in ameliorating effects of diabetes investigated in animal model • Association of phytochemicals in selected vegetables with metabolites in animal cells and anti-inflammatory properties investigated <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Anti-hyperglycemic effect of bitter gourd validated in insulin-resistant patients in India and Tanzania
<p>Output 2. Dietary strategies and food based intervention packages developed</p> <p>Outcome: AVRDC – The World Vegetable Center, national agricultural research and extension system and non-governmental organizations promote home, school and community gardening, distribute seed kits to disaster affected areas and advocate more nutritionally effective use of vegetables.</p>	
<p>Activity 2.1</p> <p>Develop home, school and community garden packages for poor households in Asia and Africa for technology adaptation and increased access to vegetables</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Socioeconomic outcomes of home garden practice on village members conducted in Jharkhand and Punjab <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Socioeconomic and nutritional outcomes of home garden practice on village members conducted • Nutrition garden seed kits designed and sustainable seed systems for school/community gardening developed • Participatory demonstration vegetable gardens in selected schools and communities established <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • School and community gardens in all target areas established and functional

<p>Activity 2.2</p> <p>Develop nutritious vegetable seed kits for disaster response in tropical and sub-tropical Africa and Asia</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • 1,000 kits per location produced in Taiwan, Thailand, India, Tanzania and Mali, and made available for distribution in response to future disasters in Africa and Asia • Easy-to-understand instructions on cultivation, field management, and food preparation in various local languages prepared for publication <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • 2,000 kits per location in Taiwan, Thailand, India, Tanzania and Mali, and made available for distribution in response to future disasters in Africa and Asia • Easy-to-understand instructions on cultivation, field management, and food preparation in various local languages prepared for publication <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • 3,000 kits per location produced in Taiwan, Thailand, India, Tanzania and Mali, and made available for distribution in response to future disasters in Africa and Asia • Easy-to-understand instructions on cultivation, field management, and food preparation in various local languages prepared for publication
<p>Activity 2.3</p> <p>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 Africa</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Nutrition improved and modified food practices and recipes recommended and promoted in Punjab and Jharkhand • Nutrition improved recipes and vegetable conservation methods researched and developed for promotion in Mali <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Nutrition leaflets, posters, booklets and recipes books developed, printed and distributed in Punjab and Jharkhand • Bitter gourd recipes developed based on local preparation methods and anti-diabetic study for promotion in diabetic community <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Bitter gourd recipes developed based on local preparation methods and anti-diabetic study for promotion in diabetic community • Dietary strategies for bitter gourd production and consumption developed for low income and high diabetic prevalent regions • Recipes designed and promoted; school and community feeding program conducted

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

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

Activity 3.1

Identify, map, and analyze components of supply chains for high-value crops in sub-Saharan Africa and Asia

Output Targets 2011

- Recommendations developed for strengthening market supply chains for vegetables in Malawi and Mozambique
- Marketing groups empowering youth for market oriented vegetable production in Tanzania mapped and identified
- Baseline survey (to include current production, post-harvest and consumption practices, and vegetable variety utilization) conducted in Indonesia

Output Targets 2012

- Supply chains for high-value crops' input and output markets in selected places in Asia and Africa analyzed
- Marketing systems of bitter melon in selected places in India assessed
- Baseline data on the production and consumption of fermented vegetables in Thailand established and additional needs for research and development, capacity building and policy advocacy identified
- Vegetable value chain study conducted in Indonesia
- Indonesia baseline survey report completed

Output Targets 2013

- Adoption studies of β -carotene rich tomato in Mali conducted
- Baseline data on the production and consumption of fermented vegetables in Cambodia, Laos and Myanmar established and possible cross-country influences with Thailand analyzed

<p>Activity 3.2</p> <p>Facilitate the establishment of enhanced market coordination mechanisms for vegetables in supply chains framework in sub-Saharan Africa, South Asia, and Southeast Asia</p>	<p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Effective linkages along the African indigenous vegetables value chain enhanced in Tanzania through field days and seed fairs involving indigenous vegetable strategic actors <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Impact assessment of training in production and consumption of vegetables in Mali conducted • Ex-post evaluation of vegetable production and consumption in Mali conducted • Twenty youth groups for market oriented vegetable production and consumption in Tanzania linked to functional markets by signing contracts with buyers and processors
<p>Activity 3.3</p> <p>Develop and enhance training curricula and materials on proper postharvest management and marketing skills for trainers in Asia, Pacific and Africa</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • Final training curricula and materials for the Farmer-Led Seed Enterprise model developed and promoted in Tanzania to improve marketing skills • Guidelines for developing good practices for establishing Farmer-Led Seed Enterprise in Tanzania developed • Twenty youth groups for market oriented vegetable production trained in market information systems and direct product marketing skills • Conduct participatory training for farmers using the Training of Trainers approach in Tanzania for at least 60 farmers • International Vegetable Training Course curricula and lecture/training materials on vegetable postharvest, marketing and nutrition reviewed and updated annually <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Develop and produce promotional materials for the best Farmer-Led Seed Enterprise model • International Vegetable Training Course curricula and lecture/training materials on vegetable post harvest, marketing and nutrition reviewed and updated annually <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • International Vegetable Training Course curricula and lecture/training materials on vegetable post harvest, marketing and nutrition reviewed and updated annually

<p>Activity 3.4</p> <p>Strengthen postharvest research capacity of national partners through trainings and awareness raising on post harvest losses and post harvest research in national and regional level in Asia, Africa and the Pacific</p>	<p><i>Output Targets 2011</i></p> <ul style="list-style-type: none"> • At least 15 participants from Asia, Africa and the Pacific trained on vegetable production, post harvest and marketing <p><i>Output Targets 2012</i></p> <ul style="list-style-type: none"> • Center of excellence of post harvest research and training established in at least one country in sub-Saharan Africa • Best Farmer-Led Seed Enterprise models in Tanzania shared and promoted for scaling up • Sub-Saharan Africa post harvest technology networking activities conducted • At least 20 participants from Asia, Africa and the Pacific trained on vegetable production, post harvest and marketing <p><i>Output Targets 2013</i></p> <ul style="list-style-type: none"> • Train at least 25 participants from Asia, Africa and the Pacific on vegetable production, post harvest and marketing
<p>Output 4: Policy recommendations with an aim to increase vegetable consumption developed, capacity strengthened and technology and knowledge disseminated</p> <p>Outcome: Consumers are aware of the health-promoting benefits of increased utilization of vegetables through better access to information, enhanced capacities of national agricultural research and extension systems and non-governmental organizations and improved policy support.</p>	

Activity 4.1

Conduct training courses and promotion campaigns to increase production, utilization and consumption of nutrient-rich vegetables in Asia and Africa

Output Targets 2011

- Quarterly 2-3 day training courses on vegetable home garden production, processing and preservation delivered to youth and women groups in Tanzania
- Consumer awareness of vegetable consumption and nutrition on health promoted through field days, seed fairs, national agricultural shows and on-farm demonstration plots
- Training courses on vegetable production and processing conducted in Mali for participants from Bamako, Kita, Guene, and Kirina
- Twenty youth groups for market oriented vegetable production in Tanzania trained in market information systems, nutrition, consumption and utilization of nutrient-rich vegetables
- Farmer field days conducted in Central Asia and the Caucasus countries to promote increased production and consumption of vegetables

Output Targets 2012

- Quarterly 2-3 day training courses on vegetable home garden production, processing and preservation delivered to youth and women groups in Tanzania
- Consumer awareness of vegetable consumption and nutrition on health promoted through field days, seed fairs, national agricultural shows and on-farm demonstration plots
- Approaches for effectively promoting indigenous vegetable utilization and overall vegetable consumption in Indonesia explored
- Farmer field days conducted in Central Asia and the Caucasus countries to promote increased production and consumption of vegetables
- Training course on processing and preservation of vegetables conducted in Uzbekistan for women groups, small scale farmers and agricultural/nutrition/health researchers and extensionists

Output Targets 2013

- Quarterly 2-3 day training courses on vegetable home garden production, processing and preservation delivered to youth and women groups in Tanzania
- Consumer awareness of vegetable consumption and nutrition on health promoted through field days, seed fairs, national agricultural shows and on-farm demonstration plots
- Indigenous vegetable utilization and overall vegetable consumption in Indonesia promoted
- Farmer field days conducted in Central Asia and the Caucasus countries to promote increased production and consumption of vegetables



AVRDC's professional staff addresses the needs of a diverse and dispersed global research center in administration, finance, internal audit, human resources, communications, library, IT, data management, and technology dissemination.

Administration and Services

Efficient, supportive, aware, and prepared

The Office of Administration and Services provides administrative support to headquarters and regional offices including human resources, purchasing, travel arrangements, technical services, food and accommodation, security, and host country liaison.

New Enterprise Resource Planning (ERP) software has been implemented; it has been configured to address issues such as integrating budgets and human resource functions to provide managers with accurate, timely financial reports and personnel information. A Systems Administrator has been recruited to manage and oversee the operation of the system.

Full cost recovery for services has been implemented since 2008. Our staff members gradually have adapted themselves to this practice. By shifting costs for services to projects, the Center can decrease its overheads and build up reserves for the future.

The Global Risk Management Committee was established at headquarters in June 2008. In 2009, a Risk Management Team was formed in each regional center and sub-regional office. The Global Risk Management Committee works with regional Risk Management Teams to address pertinent issues such as staff safety at work, during natural disasters, and in times of social unrest such as occurred in 2010 in Bangkok and Madagascar and in 2011 in Arusha. The Center and *icipe* (African Insect Science for Food and Health, an

international center headquartered in Nairobi, Kenya) have agreed to work out modalities to provide a safe haven to each other for our international staff in the event of a crisis or emergency in Tanzania or Kenya. A list of emergency contacts has been developed in 2010 to include the emergency contacts in all locations of the Center, which would also facilitate risk management.

With the renovation of the Center's guest house, we are now able to provide more comfortable accommodation for visiting dignitaries, board members, meeting and workshop participants, and other guests. With scheduled training to enhance the staff members' cooking skills, the Center's Cafeteria is able to provide a diversity of cultural cuisines to our staff and guests. The second phase of the Food and Dormitory Services renovation, financed by the Taiwan Ministry of Foreign Affairs, was completed in 2010, which included cafeteria, kitchen, laundry room, dormitory rooms, suites, etc., and the Center can now provide an even higher standard of service.

With the Ministry of Foreign Affairs' special funding, the Center's genebank building was renovated in 2010 to safely and securely house its germplasm collection. Seed storage facilities were expanded to accommodate the current collection and provide room for new germplasm; thermal barriers, cold storage units, and the building's electrical wiring was upgraded to reduce electricity costs and improve safety and effectiveness.

Besides routine maintenance and repair work for all buildings, residences, greenhouses, and fields at headquarters, Technical Services built 575 meters of new drainage and irrigation ditches around the research fields and constructed new gravel pavement on the field roads. Improvements that have been made to farm facilities include procurement of a theodolite system for field surveys, repairs for steam sterilization of compost, replacement of



an evaporative cooling pad installed in greenhouses constructed in 1972 and 1992, installation of roof waterproofing membrane at the greenhouse constructed in 1972, etc.

In 2010, besides supporting all procurement at headquarters, Administrative Services also managed procurement of agricultural supplies and instruments for our Regional Center for Africa and will continue to provide purchasing support to the Center's global offices.

In 2010, the Government of Taiwan continued to contribute core funding of US\$5.767 million to the Center. The Taiwan Council of Agriculture (COA) and National Science Council (NSC) funded 26 projects for a total 2010 project budget of US\$332,290. After a lengthy process of consultation, the Taiwan Ministry of Foreign Affairs (MOFA) granted the Center special funding of US\$2.9 million in 2010 for the Center's global activities and infrastructure improvement. As the Ministry of Foreign Affairs' special funding was approved only in November 2010, the duration of 2010 funding was retroactive from January 2010 and extended to 2011.

Consultations for the Center's core contribution from Taiwan for the next four years started in 2010. It is expected that a favorable response from Taiwan will be offered to the Center. The Center might be granted approximately the same amount of core contribution from Taiwan from 2011 through 2013. However, as Taiwan's Ministry of Foreign Affairs' support to the Center from 2008-2010 is special, project funding, it is uncertain if the Center will again be granted this special funding in 2011 and onward.

Financial Management

Attaining financial stability and steady growth

The Center has responded very well and shows signs of growth and stability despite the current slowdown in global economic recovery process which is also affecting the donor community. The Center continues to maintain a stable level of unrestricted funding and improved funding levels are projected. This is a clear indication of the belief and trust our traditional donors have in the quality of the research and development

efforts of the center. Thanks are due to our host government (Republic of China) that has continued to take the lead in this area. Modest progress has been made in the area of diversification and broadening of unrestricted funding in the current year, however, attaining the required level is still a challenge. The restricted funding is still expected to pick up as the funding situation of donor communities stabilizes. This area will be a focus during the period of this Medium-Term Plan. The improvement and upgrade of infrastructure at Headquarters and in the regional centers, including laboratories, information technology, buildings, and vehicles continues into 2011. The Center has reported an increased surplus result for 2010 and has cautiously projected a balanced budget for the following years. The Center's financial health indicators in the area of short term solvency and long term financial stability continue to improve and are within the acceptable level of the other international agricultural research centers. This is gradually positioning the Center towards attaining a comfortable level of financial reserves.

The Center will continue the quest to deliver efficient and effective research and development output while overcoming the challenge of inadequate funding. The implementation of the Enterprise Resource Planning (ERP) system which began in 2009 is almost completed and is already in use by the Center, including the regional offices. The system has brought tremendous standardization and efficiency the operations of the Center which is now well positioned to respond better to our donor's requirements and other stakeholders.

We continue to face the uncertainty that surrounds donor funding, which could affect the Medium-Term Plan; the volatile exchange rate of the US dollar, which is the Center's base currency; downturn of the interest income from investments; and also the effect of the current slow economic recovery affecting almost all donor countries. The management will constantly and continuously review these uncertainties, and the likely consequences, and respond accordingly.



Internal Audit

Maximizing donor investment

The internal audit function at AVRDC – The World Vegetable Center is to assist in maintaining a good governance mechanism to safeguard donors' interests and reinforce staff members' compliance with the Center's regulations. Internal audit has examined some of the Center's Standard Operating Procedures (SOP) and drafted new Standard Operating Procedures where required. Internal Audit has also performed audits of regional office operations, financial interactions with other collaborating institutions and organizations, and some of the Center's internal processes.

The Center has implemented a new Enterprise Resource Planning (ERP)

system, Maconomy, since May 2010. The ERP system was procured to help all staff members to work efficiently and effectively in their routine tasks—particularly in finance, and project and human resources management. The ERP system must be modified to fit the Center’s needs and improvement is ongoing. During the process of improving and adapting the new ERP system, Internal Audit will continue to provide assistance when it is appropriate and/or necessary.

Internal Audit has also had an important role in some activities not directly involved with audit activities. For example, Internal Audit participated in the processes involved with genebank reconstruction after a fire destroyed the new construction in progress of the genebank extension on May 31, 2010. During Internal Audit’s participation in the genebank reconstruction activities, the Internal Auditor also reviewed the fire protection design and layout in the re-designed kitchen of Food and Dormitory Services (FDS) as well as other fire protection facilities at the Center, and subsequently provided suggestions to the Management about preventing and mitigating fire accidents in the future.

The Center cannot fulfill its mission without donor support. Proper allocation and utilization of the Center’s limited resources to generate high quality operational results is the best way to express the Center’s thanks for the donors’ long term confidence and support. Internal Audit will work closely with the Management to ensure donors’ needs and interests are met and thus to achieve the Center’s objectives.



Human Resources

Nurturing talent and culture for global impact

The strategic objective of Human Resources Management is to raise the profile of the Center as an international organization by building global and diverse talent, nurturing multicultural values, and adopting equitable and inclusive policies and practices through continuous learning of the center’s leadership and its staff members.

Accordingly, interventions are planned and being implemented in the following areas.

1. Policy Framework
2. Human Resources Systems
3. Organization Development
4. Talent Management

Policy Framework: The new Human Resources Policy, applicable for all staff cadres, and the revised Regulations for Internationally-recruited staff (IRS) has been fully implemented. The staff members appreciate the changes in terms of clarity and equitable dispensation.

Further the Center’s compensation and benefits was reviewed using external benchmarking with other international agricultural research centers. Standard market competitive compensation levels are being developed. Individual

compensation is reviewed for internal equity and adjustments are being made in a phased manner keeping the affordability of the Center in perspective. This 'standard cost' structure is used for project proposals as well as in new hiring enabling the Center to attract good talent as well as retain the current talent.

Human Resources Systems: As other organizational business processes, Human Resources services transactions are also processed to a large extent manually. The implementation of Maconomy, the Center-wide Enterprise Resource Planning solution, has changed the scenario. Maconomy, though primarily designed for financial and project management, has been adapted creatively for the whole set of Human Resources business processes for recruitment, employee enrollment, contract management, salary and benefits processing, and leave management.

To further optimize Human Resources activities, Maconomy is being further adapted for competency and performance management. The implementation of Human Resources applications has simplified the processes, improved recordkeeping and controls and provides convenience to staff for information and transaction processing.

Organization Development: Through focus group discussions, staff members are encouraged to discuss and enhance their understanding of the nature of global organizations (international agricultural research centers) and their characteristics such as shared common values, multiculturalism, diverse staff, inclusive behavior, thinking big, highly innovative, etc., and to explore ways to enhance these aspects within AVRDC.

Reorganization: There is a continuous challenge to reorganize the organization



structure, competencies and processes in line with the evolving stakeholders' needs, funding, strategic positioning, etc. Human Resources helps the management in planning and implementing reorganization initiatives in collaboration with the line management. Staff members are encouraged to review their roles, negotiate with their supervisors and team members and agree on revised role descriptions and work plans.

Talent management: The Center is successful in recruiting best talent for key positions confirming its competitive positioning. The revised policies, competitive compensation along with Center's evolving stature as an international agricultural research center is helping to be competitive in the market. The Center, while marketing its purpose and activities to a wide range of audiences, also aims to create a 'brand' that AVRDC – The World Vegetable Center is one of the best places to pursue careers in vegetable research and development for enabling prosperity for the poor and health for all.

Human Resources is initiating an exercise to identify 'tasks' and complementary 'skill sets' that are required for effectively accomplishing the research and development activities by various jobs. This will help the Center to plan its human resources, match requirements to projects, optimize deployment, identify skill gaps and train staff.

Training: To develop the skills and develop organizational and leadership capabilities, the Center has a training plan and is exploring mechanisms to fund the training plan. The plan aims at providing a minimum of five and two days of training every year to the internationally- and nationally-recruited staff respectively, within the next two years. Measures are also taken for 'transfer of learning' by involving the

supervisors to mentor the staff after attending training.

Communications and Information

Increasing recognition, sharing knowledge, informing strategy

Ensure understanding, increase awareness, foster transparency, and assure support from staff, stakeholders, and the public at large: these are the goals of the Center's Communications and Information group. The group comprises eight members—secretary, photographer, graphic designer, visitor services coordinator, three librarians, and a group head/editor.

Concepts and Tools: Communications and Information helps to shape the public perception of the Center by conceptualizing strategies and creating materials to promote its research and development activities and status as an international institution. Products include posters, displays, and promotional material for events, from national or regional workshops to major international conferences such as the 2010 Asian Seed Congress in Taiwan and the Crawford Fund Conference in Australia; pre-event documentation (e.g. West and Central African Council for Agricultural Research and Development roundtable in Senegal); and post-event materials including summary notes and CDs.

Media and News: Communications and Information actively engages outlets across the media spectrum: print, internet/social media, radio, television, and film. In 2010, Facebook pages in English, Chinese, and French were established, a Twitter feed launched, and a YouTube channel opened. Refinements to the Center's website continue. The Communications group engages journalists and media representatives through inquiries, briefings, and press conferences on selected topics.

The Center more than doubled its news coverage in 2010 through more careful story placement and monitoring of news outlets. The Center's bi-weekly newsletter, renamed *Fresh*, has a new banner and livelier look. *Fresh* highlights current research themes, promotes Center activities to external audiences, and emphasizes AVRDC's role in the context of global developments. Information for staff at headquarters is shared through the *Big Cabbage*, a bulletin in English and Mandarin.

Identity: The group aims to project a coherent, recognizable corporate identity through the consistent application of the AVRDC logo and other design elements by staff and project partners. Corporate gifts for investors and other partners focus on quality and recognition. Further



opportunities for promotion and income generation will arise when a storefront is established on the Center's web site.

Staff: The Communications and Information group assists management and staff to ensure messages are congruent with the Center's strategy and policy. Information packages,

presentations, press kits, and posters are made available to the Center's regional offices. The group briefs staff for media interviews, and offers guidance for staff members in documenting their work through photography, video, and other technologies.

Visitors: On average more than 100 groups and delegations (approximately 1000 people) visit AVRDC headquarters each year. The Communications and Information group organizes tour schedules tailored to specific visitor interests and presents a briefing on the Center's mission and activities to all visitors. More than 100 delegates from the 2010 Asian Seed Congress received a special tour of the Center in November 2010.

The AVRDC Library: The Library is a multidisciplinary resource center that circulates the information vital to researchers, scholars, partner institutions, the private sector, and the public. In mid-2010 the librarians began the migration of the catalog to a new database structure, which will allow for easier searching across platforms and better integration with other research libraries. The migration will be complete in the first quarter of 2011. The Library's web interface is being redesigned to serve as the primary contact point for organizing, archiving, and sharing the Center's research and grey literature with a globally dispersed audience. Demand for personalized search services continues to increase. *Library News*, a regular e-newsletter, keeps staff up-to-date on recent acquisitions and the latest publications by their colleagues.

Editorial: The Center's editor annually reviews more than 200 articles, abstracts, books, proposals, reports, award applications, newsletters, and other documents for grammar, style, and coherence of content structure and design. The editor guides the internal peer-review process for researchers, helps researchers present information

in formats appropriate for their target audiences, and tracks the impact of various communication tools. Publications produced in 2010 include the field guides *Insect and Mite Pests on Eggplant* and *Safer Tomato Production Techniques, Market analysis of fresh vegetables in Solomon Islands* (Research in Action 4), and the *Center's Strategic Plan 2011-2025, Year in Review 2009*, and *Annual Highlights*.

Distributed website content

development and maintenance: Based on an open-source content management system, the Center's website can now be accessed by trained content contributors at headquarters and in the regional offices. Headquarters coordinates this distributed development to ensure that all content is appropriate and up to date.

An interactive intranet: The current intranet will be redesigned to incorporate greater use of social networking tools in addition to organizational documents. This will shift more organizational communications to the intranet, reduce staff e-mail loads, and help build a more open, collaborative online organizational culture.

Information Technology

Connecting a global Center

Information technology and web services provide the essential communications system for a distributed global organization to continue to deliver its research and development outputs. The Center's Information Technology and web services must be able to support the growing complexity of its global operations. The following needs and trends will be the major focus of future activities.

Increasing reliance on Information Technology services due to the use of Enterprise Resource Planning (ERP):

The introduction of the Maconomy ERP system in 2010 is changing the culture of the Center and how it does business. There will be a greater reliance of all staff on Information Technology services and a greater need to ensure continued uninterrupted operations. Strong Information Technology oversight will be required to help maintain and develop the Center's capacity.

A more structured approach to security threats and data management:

Over 90% of global e-mail traffic is now spam and organizational security threats are becoming more diverse and sophisticated. As the Center depends more on its Information Technology system for its daily operations and communications, it will be essential to ensure its security and to improve the security consciousness of all staff members. The Center must implement best practices for security and ensure archiving system of e-mails as they now form a major data repository. Offsite backup of data archives also needs to be implemented for all the Center's locations due to significant risks from natural disasters and social instability in some Center locations.





High bandwidth and more diverse communication services: Good connectivity is essential to the effective working of a distributed global organization. The Center currently generates over 14 GB of e-mail traffic per month. New high bandwidth connections to Africa are making it more feasible to expand the range of our corporate communications to include videoconferencing and VoIP (Voice over Internet Protocol) and there are opportunities to expand the communications bandwidth between headquarters and other partner institutions. Investment is needed to ensure that connectivity keeps up with growing organizational demands. Sharing of genomics and other databases over the web may also require greater high speed internet connectivity.

Expanded use of cloud computing: Improved connectivity and 'cloud computing' services provided by third parties provide opportunities to explore some open access software. The Center's use of Gmail as the Center's email provider can be expanded for greater file sharing and file storage. Off-site data storage is being explored to provide secure back-up of the Center's critical databases.

Global Technology Dissemination

Sharing knowledge and skills

The Global Technology Dissemination (GTD) group has three main goals: to integrate vegetable technologies from the Center and other sources and make them readily available to farmers, trainers,



consumers, public/private institutions, and other end users; to respond to disaster situations in less-developed countries by providing appropriate short-term development activities in line with the Center's strengths and abilities; and to enable training and capacity building activities at headquarters to be conducted in an effective, efficient manner.

The group actively disseminates technologies that involve all four research and development Themes at the Center. In collaboration with the breeding groups, Global Technology Dissemination has designed a web-based seed catalog and promotes the Center's improved lines of tomato, pepper and other vegetables to stakeholders and it facilitates multi-location variety trials. The group also has a vital role in the Center's development-oriented donor-funded projects; it recently led a project in Indonesia which trained 1648 farmers in chili pepper integrated crop management through Farmer Field Schools and it provides a support/service role in a wide range of projects in Asia, Africa, and the Pacific. The group coordinates its activities with the regional centers and offices to implement the Center's mission.

Global Technology Dissemination is responsible for innovating the processes and strategies for the Center's

development-oriented projects to maximize impact at the farmer level. The group is compiling information on the Center's mature technologies into a database, as part of the Center's intellectual assets management. The database is being used to enable efficient dissemination of technologies via the AVRDC website, projects and workshops. Global Technology Dissemination is working with other groups at the Center to develop extension publications, which are incorporated into a comprehensive database, that transfer the Center's technologies in ways that enable adaptation by end users.

Global Technology Dissemination manages the Demonstration Garden at headquarters, which has been recently developed to display clearly a wider range of the Center's technologies to visitors and trainees. Nutritional and other information about each crop can be found on recently-installed signs. Global Technology Dissemination staff members give tours of the Demonstration Garden to visitors.

Global Technology Dissemination is integrating vegetable technologies from the Center and other sources into coherent and holistic packages that can be adapted by resource-poor farmers for their specific situations, including climate change scenarios. The group's pro-poor approach is oriented towards meeting local stakeholders' needs and maximizing impact, directly in line with the Center's mission. Often this will involve a participatory approach, which is one of the group's areas of expertise.

Global Technology Dissemination provides a feedback function to the Center's research groups regarding local vegetable production and consumption constraints to enable research to be increasingly pertinent to end users. One key component of this is the quarterly publication of *Feedback from the Field*, a concise news bulletin that communicates urgent issues and technology applications from the field to its readers. A Facebook

webpage was recently established to increase the exposure of this publication.

The group also implements the Center's disaster response program, which features seed distribution of hardy, fast-growing and nutritious vegetable crops to disaster survivors. Over 120kg of seeds were sent to Haiti to aid earthquake victims in 2010, and before that the Center supplied seed to Taiwan villagers who experienced the devastation of Typhoon Morakot. In collaboration with the regional centers and offices, Global Technology Dissemination produces the seeds for this effort.

In addition, Global Technology Dissemination provides an important service role by facilitating administrative issues and logistics for trainees coming to headquarters for capacity building activities across a range of disciplines.

Biometrics

Data management for better research

Experimental design: The input of Biometrics at AVRDC – The World Vegetable Center begins with experimental planning and design. This input is a prerequisite when writing project proposals to ensure that the outputs of projects will be valid and meaningful. Before and during the implementation of the Center's research and development activities, the high standard of data generated from AVRDC research is ensured through the efficient use of biometrics from experimental design, field plot techniques to plot sampling techniques.

Data management: Knowledge of sound biometrical methods and access to statistical information and techniques is essential for reliable, high-quality research. Part of the consulting services includes remedial measures for problem data, statistical analysis of data, to presentation and interpretation of



results. In addition, Biometrics provides advice on how to use statistical software available at AVRDC.

Improving skills: By providing consulting services or general help in designing experiments, dealing with data, or other statistical issues, Biometrics aims to improve the skills and understanding of researchers, national agricultural research and extension systems collaborators, and scientists who may be infrequent users of statistics. Biometrics training was an integral part of the Center's 2010 Regional Training Course held in Thailand. A benchmark can be set to assure the quality of research outputs right from the start – at the planning stage, through detailed evaluation of experimental plans. This helps to assure proper recording and archiving of procedures used in each experiment, and proper statistical review of reports, proposals, and scientific manuscripts submitted for publication in international peer-reviewed journals.

Quality publications: The quality of all AVRDC's scientific manuscripts is ensured through comprehensive statistical review. This review is part of the Center's internal peer-review systems and is used to ensure the Center's credibility among our donors, clients, and the scientific community. Project reports are also reviewed before submission to donors, as are general reports, proposals, abstracts, scientific papers, and posters for publication.



Ph: 2440331
عمر شعی ساری سنٹر بنارس والے
ARSHI SAREE CENTRE
BANARAS WALE WHOLE SALE

Natural
Essential Nutrient #1

St

Name	Position	Location	Nationality
Afari-Sefa, Victor	Scientist – Socioeconomics	Arusha, Tanzania	Ghana
Belarmino, Marilyn	Scientist – Genetic Resources	Arusha, Tanzania	Philippines
Bhattarai, Madhusudan	Agricultural Economist	Shanhua, Taiwan	Nepal
Chadha, M. L.	Regional Director (retiring in April 2011)	Hyderabad, India	India
Chagomoka, Takemore	Liaison Officer for Cameroon and Seed Business Specialist	Yaoundé, Cameroon	Zimbabwe
Chang, Yin-Fu	Deputy Director General – Administration & Services	Shanhua, Taiwan	Taiwan
Chen, Jack	Postdoctoral Fellow, Molecular Entomology (left in January 2011)	Shanhua, Taiwan	Taiwan
Dagnoko, Sokona	Vegetable Breeder	Bamako, Mali	Mali
Dhillon, Narinder	Vegetable Breeder, Cucurbits	Bangkok, Thailand	India
Easdown, Warwick	Principal Scientist (take over as Regional Director, 1 May 2011)	Hyderabad, India	Australia
Ebert, Andreas	Genebank Manager and Global Theme Leader, Germplasm	Shanhua, Taiwan	Germany
Endres, Theresa	Community Development Specialist (Nutrition)	Bamako, Mali	Germany
Gniffke, Paul	Plant Breeder (Pepper and Bulb Allium)	Shanhua, Taiwan	USA
Habicht, Sandra	Postdoctoral Fellow, Biochemical Nutrition	Shanhua, Taiwan	Germany
Hanson, Peter	Plant Breeder (Tomato and Indigenous Vegetable Research) and Global Theme Leader, Breeding	Shanhua, Taiwan	USA
Holmer, Robert	Regional Director and Global Theme Leader, Consumption	Bangkok, Thailand	Germany
Huang, Jenny	Consultant, Public Relations and Partnerships	Shanhua, Taiwan	Taiwan
Hughes, Jacqueline d'Arros	Deputy Director General - Research	Shanhua, Taiwan	United Kingdom
Inukonda, Nagaraj	Director of Human Resources	Shanhua, Taiwan	India

Name	Position	Location	Nationality
Javier, Edwin	International Variety Development Coordinator (left in March 2011)	Shanhua, Taiwan	Philippines
Keatinge, J.D.H.	Director General	Shanhua, Taiwan	Ireland
Kenyon, Lawrence	Plant Virologist	Shanhua, Taiwan	United Kingdom
Knirim, Dennis	Postdoctoral Fellow in Virology	Shanhua, Taiwan	Germany
Kriesemer, Simone Kathrin	Research Associate (Socioeconomist)/ Postdoctoral Fellow	Shanhua, Taiwan	Germany
Kumar, Sanjeet	Vegetable Breeder for the Sudano-Sahelian Region	Niamey, Niger	India
Kwazi, Nadine	Executive Assistant to the Director of RCA	Arusha, Tanzania	Zambia
Ledesma, Dolores R.	Board Secretary and Biometrician	Shanhua, Taiwan	Philippines
Lee, Jung-Sup	Plant Pathologist	Shanhua, Taiwan	Korea
Lu, Vincent	Internal Auditor	Shanhua, Taiwan	Taiwan
Luther, Greg	Technology Dissemination Specialist	Shanhua, Taiwan	USA
Luther, Kartini	Assistant to Deputy Director General-Research	Shanhua, Taiwan	USA
Mak, Adrienne	Manager, Management Support & Human Resources Services	Shanhua, Taiwan	Taiwan
Mavlyanova, Ravza	Regional Coordinator for Central Asia and the Caucasus	Tashkent, Uzbekistan	Uzbekistan
Mecozi, Maureen	Head, Communications and Information	Shanhua, Taiwan	USA
Moustafa, Ahmed	Regional Director	Dubai, UAE	Egypt
Nair, Ramakrishnan	Vegetable Breeder, Legumes	Hyderabad, India	India
Ndung'u, Philip Kamau	Regional Administration and Finance Officer	Arusha, Tanzania	Kenya
Neave, Suzanne	Project Coordinator, Solomon Islands	Honiara, Solomon Islands	United Kingdom

Name	Position	Location	Nationality
Öberg, Annelie	Manager, Grants and Partnership Development	Shanhua, Taiwan	Sweden
Ojiewo, Christopher	Vegetable Breeder	Arusha, Tanzania	Kenya
Olatifede, Kolade	Director of Finance	Shanhua, Taiwan	Nigeria
Rakotoarisoa, Benjamin	Liaison Officer for Madagascar (left in March 2011)	Aloatra, Madagascar	Madagascar
Ramasamy, Srinivasan	Entomologist	Shanhua, Taiwan	India
Rouamba, Albert	Vegetable (Onion) Breeder	Bamako, Mali	Burkina Faso
Schafleitner, Roland	Head, Molecular Genetics	Shanhua, Taiwan	Austria
Tanyongana, Ronia	vBSS Program Management Coordinator	Arusha, Tanzania	Zimbabwe
Tenkouano, Abdou	Regional Director	Arusha, Tanzania	Burkina Faso
Wang, Jaw-fen	Plant Pathologist and Global Theme Leader, Production	Shanhua, Taiwan	Taiwan
Yang, Ray-yu	Nutritionist	Shanhua, Taiwan	Taiwan





The following tables show the trend of the Center's budget over the period 2010 to 2013 along with sources of funding and allocation of finances to the thematic research and development activities:

Table 1: Details of the 2010 actual outcome along with the budget

Table 2: How the estimated 2011 budget compares to 2010 actual and budget along with thematic allocation

Table 3: Main sources of revenue between the 2010 and 2011 budget

Table 4: Expected budgets for the next three years and how the allocations to

themes are expected to change. By 2013 the amount allocated to research themes is projected to have slightly increased to 78% of the total budget, while the amount allocated to administration is expected to be 22%. The allocations between the themes are fairly constant between 2012 and 2013, except for Theme Production, which is likely to reduce to 27% in 2013 from 32% in 2012, and Theme Consumption, which now encompasses Marketing and Nutrition and will increase to 26% in 2013 from 23% in 2012. The total funding is expected to gradually increase to slightly over US\$ 20 million by 2013.

Table 1: Financial activities for the twelve months ending 31 December 2010

	2010 Actual					2010 Budget		
	Unrestricted		Restricted		Total	%	Total	%
Revenues								
Unrestricted grants	7,308,921				7,308,921	49%	6,962,236	40%
Restricted grants			7,135,106		7,135,106	48%	9,833,247	57%
Other revenues	410,228				410,228	3%	400,000	2%
Total	7,719,149	52%	7,135,106	48%	14,854,256	100%	17,195,483	100%
Expenditures								
Personnel								
- International	2,928,104		1,495,597		4,423,702	31%	4,699,930	27%
- Local	4,334,799		624,227		4,959,026	34%	4,930,000	29%
Operating expenses								
- Field labor	25,558		335,181		360,739	2%	200,000	1%
- Supplies & services	114,658		1,590,613		1,705,271	12%	1,962,472	11%
- Travel	28,831		414,851		443,682	3%	869,378	5%
- Training and workshops	-		313,391		313,391	2%	553,952	3%
- General expenses	360,335		659,250		1,019,585	7%	1,538,000	9%
Contract outreach research	-		621,564		621,564	4%	1,537,000	9%
Contingency							600,000	3%
Depreciation/special project assets	61,444		1,080,433		1,141,877	8%	994,922	6%
Sub-total	7,853,729	52%	7,135,106	48%	14,988,835	104%	17,885,654	104%
Indirect cost recovery (overhead)	(545,451)				(545,451)	-4%	(725,591)	-4%
Total	7,308,278	51%	7,135,106	49%	14,443,384	100%	17,160,063	100%
Changes in net assets	410,871		0		410,871		35,420	
Net assets at the beginning of the year	137,785				137,785		137,785	
Net assets at the end of the year*	548,656		0		548,656		173,205	

* Excludes working capital fund of \$1,220,550; Capital replacement fund of \$157,465; and Fixed Asset fund of \$221,985 at the end of 2010

Table 2: 2011 final budget estimate (USD'000)

	2011		2010		2010		
	Estimate		Actual		Budget		
Revenues	14,434		14,854		17,195		
Budget Allocations by Objects							
Personnel							
- International	4,631	32%	4,424	31%	4,700	27%	
- Local	4,271	30%	4,959	34%	4,930	29%	
Operations							
- Field labor	200	1%	361	2%	200	1%	
- Supplies & services	1,789	12%	1,705	12%	1,963	11%	
- Travel	563	4%	444	3%	869	5%	
- Training and workshops	300	2%	313	2%	554	3%	
- General expenses	1,000	7%	1,020	7%	1,538	9%	
- Contracted outreach research	1,000	7%	621	4%	1,537	9%	
Equipment, facilities & renovation	895	6%	1,142	8%	995	6%	
Contingency	250	2%			600	3%	
Sub-total	14,899	104%	14,989	104%	17,886	104%	
Indirect cost recovery (overhead)	(511)	-4%	(546)	-4%	(726)	-4%	
Total	14,388	100%	14,443	100%	17,160	100%	
Changes in net assets	46		411		35		
Net assets at the beginning	549		138		138		
Changing in net assets	46		411		35		
Appropriated to capital replacement fund							
Carried over/forward *	595		549		173		
<i>* Excludes working capital fund of \$1,220,550; Capital replacement fund of \$157,465; and Fixed Asset fund of \$221,985 at the end of 2010</i>							
Budget Allocations by Themes							
I. Strategy Themes							
I-1	<i>Germplasm: Germplasm Conservation, Evaluation and Gene Discovery</i>	2,302	16%	1,934	13%	2,746	16%
I-2	<i>Breeding: Genetic Enhancement and Varietal Development of Vegetables</i>	3,021	21%	3,470	24%	4,805	28%
I-3	<i>Production: Safe and Sustainable Vegetable Production Systems</i>	3,597	25%	3,340	23%	2,917	17%
I-4	<i>Consumption: Balanced Diets through Increased Access to and Utilization of Nutritious Vegetables</i>	2,158	15%	1,168	8%	3,946	23%
II. Administration and Services							
		3,309	23%	4,531	32%	2,746	16%
Total		14,387	100%	14,443	100%	17,160	100%

Table 3: Breakdown of Y2011 estimated revenues (USD'000)

Donor	2011		2010		2010	
	Estimate		Actual		Budget	
Unrestricted Core						
ROC	6,156		5,767		5,649	
USAID	700		243		291	
UK/DFID	809		931		809	
Japan	47		47		47	
Korea	30		30		30	
Thailand	153		141		136	
Philippines	50		0		0	
APSA	150		150		0	
Sub-total	8,095		7,309		6,962	
Other revenues	350		410		400	
Total	8,445	59%	7,719	52%	7,362	43%
Restricted Core						
Asia Pacific Seed Association			0			
Asian Development Bank	0		74		74	
Australia/ACIAR	237		409		506	
Austrian AID	0		12		12	
Bill & Melinda Gates Foundation	1,083		2,428		2,949	
CIRAD	0		15		17	
FARA	0		43		49	
Food and Agriculture Organisation	0		1		2	
Germany/BMZ/GTZ	1,125		1,045		1,269	
Global Crop Diversity Trust	59		79		59	
International Fund for Agricultural Development	0		0		0	
Japan	6		20		0	
Kagome	27		0		0	
Kilimo trust	0		0		0	
Korea/RDA	136		60		100	
Philippines			0			
ROC/COA	340		337		340	
ROC/MOFA	1,792		2,238		4,036	
ROC/NSC	140		124		140	
Sir Ratan Tata Trust Foundation	126		149		215	
UK/DFID						
USAID	754		0		0	
USDA			6			
Training funds and others	164		95		66	
Sub-total	5,989	41%	7,135	48%	9,834	57%
Total Revenues	14,434	100%	14,854	100%	17,196	100%
Contribution in-kind						
Korea	^{1/}	[50]	[50]		[50]	
Thailand	^{2/}	[45]	[45]		[45]	
GTZ/CIM	^{3/}	[60]	[.60]		[.60]	
ICARDA	^{4/}	[50]	[50]		[50]	

Note -^{1/} Outposted scientist (in kind)^{2/} Land, utilities, facilities supported by Thai Government for the Regional Office for East and Southeast Asia^{3/} 1 Nutritionist, Mali office in Africa, is partially funded by GTZ/CIM Program^{4/} ICARDA/AVRDC collaborative research

Table 4: Budget projection for 2011 - 2013 (USD'000)

	2010	2011	2012	2013
	Actual	Estimate	Projection	Projection
Budget Allocation by Objects				
Personnel				
- IRS	4,424	4,631	4,863	5,200
- Local	4,959	4,271	4,485	5,000
Operations				
- Field labor	361	200	230	200
- Supplies & services*	1,159	1,277	1,345	3,000
- Travel	444	563	480	1,000
- Training and workshops	313	300	554	400
- General expenses	1,020	1,000	938	2,250
Contract outreach research	621	1,000	1,200	1,700
Equipment, renovation and facilities	1,142	895	1,000	1,000
Contingency		250	500	500
	14,443	14,387	15,595	20,250

*This figure is net of overhead recovery

Budget Allocation by Themes									
I. Strategy Themes									
I-1	<i>Germplasm: Germplasm Conservation, Evaluation and Gene Discovery</i>	1,934	20%	2,302	21%	2,897	23%	3,853	23%
I-2	<i>Breeding: Genetic Enhancement and Varietal Development of Vegetables</i>	3,470	35%	3,021	27%	2,771	22%	4,020	24%
I-3	<i>Production: Safe and Sustainable Vegetable Production Systems</i>	3,340	34%	3,597	32%	4,030	32%	4,523	27%
I-4	<i>Consumption: Balanced Diets through Increased Access to and Utilization of Nutritious Vegetables</i>	1,168	12%	2,158	19%	2,897	23%	4,355	26%
II. Administration and Services		4,531		3,309		3,000		3,500	
Total		14,443		14,387		15,595		20,250	



Acronyms & Abbreviations

AARNET	ASEAN-AVRDC Regional Network on Vegetable Research and Development
ACCI	African Centre for Crop Improvement
ACIAR	Australian Centre for International Agricultural Research
AGRA	Alliance for a Green Revolution in Africa
ARC	Asian Regional Center
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ASEAN	Association of Southeast Asian Nations
AVGRIS	AVRDC Vegetable Genetic Resources Information System
AVRDC	Asian Vegetable Research and Development Center
Bt	<i>Bacillus thuringiensis</i>
CGIAR	Consultative Group on International Agricultural Research
CMS	Cytoplasmic male sterility
COA	Council of Agriculture
CORAF/WECARD	Conseil Ouest et Centre africain pour la recherche et le développement agricoles / West and Central African Council for Agricultural Research and Development
CSO	Civil society organization
CWANA	Central and West Asia and North Africa
ERP	Enterprise Resource Planning
ESEA	East and Southeast Asia
GAP	Good agricultural practices
GTD	Global Technology Dissemination
HortCRSP	Horticulture Collaborative Research Support Program
ICARDA	International Center for Agricultural Research in the Dry Areas
ICBA	International Center for Biosaline Agriculture
<i>icip</i>	African Insect Science for Food and Health
ICPN	International Chili Pepper Nursery
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDE	International Development Enterprises
IFAD	International Fund for Agricultural Development
IPM	Integrated pest management
IPR	Intellectual property rights
IRS	Internationally recruited staff
ISPN	International Sweet Pepper Nursery
IV	Indigenous vegetable
IVVDN	International Vegetable Variety Development Network
MAS	Marker assisted selection
MTA	Material Transfer Agreement
NAD	Nanggroe Aceh Darussalam
NARES	National agricultural research and extension system
NGO	Nongovernmental organization
NPV	Nucleopolyhedrovirus
NRS	Nationally recruited staff
NSC	National Science Council
OP	Open pollinated
PRC	People's Republic of China
QTLs	Quantitative trait loci
RCA	Regional Center for Africa
RCSA	Regional Center for South Asia
SAIC	Al-Sulaiteen Agricultural and Industrial Complex

SINGER	System-wide Information Network for Genetic Resources
SNP	Single nucleotide polymorphisms
SPC	Secretariat of the Pacific Community
SRO	Sub-regional organization
SSA	sub-Saharan Africa
SSR	Simple sequence repeat
ToT	Training of trainers programs
USAID	United States Agency for International Development
vBSS	Vegetable Breeding and Seed Systems for Poverty Reduction in sub-Saharan Africa
VIGS	Virus-induced gene silencing
VoIP	Voice over Internet Protocol
WACCI	West African Centre for Crop Improvement

