





**HORTICULTURE CRSP ANNUAL REPORT 2010**

EDITED BY AMANDA CRUMP, MARK A. BELL, RONALD E. VOSS,  
ELIZABETH J. MITCHAM, MICHAEL S. REID, PETER C. SHAPLAND,  
DIANA PUCCETTI, ELANA PEACH-FINE, AND DYLAN OWEN

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Publication design by Amanda Crump, Peter Shapland, and Elana Peach-Fine

Cover photos by James Nienhuis and Kate Scow

Internal photos by Eunice Bonsi, Kate Scow, Sean Kearney, Kelly Ivors,

James Simon, Peter Shapland, Cecilia Chi-Ham, and Kent Bradford



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## INTRODUCTION FROM THE DIRECTOR

*Ronald E. Voss*

It has been a great year for horticulture, a great year for horticulturists, and the beginning of a great journey toward higher income and improved nutrition and health by millions of rural poor smallholder farmers throughout the world. The U.S. Government confirmed its commitment to horticulture as a valuable component of addressing poverty and hunger in the world. Numerous institutions and horticulturists around the world were provided a new resource to combine efforts in conducting and adapting research and in developing information in a meaningful and organized platform. The poor, hungry and undernourished rural populace were offered new hope with additional opportunities to improve their nutrition and their incomes.

The Horticulture CRSP was initiated and funded by the US Agency for International Development in 2009 as the 9th active Collaborative Research Support Program. The Horticulture CRSP is the U.S. Government's response to a recent, internationally conducted Global Horticulture Assessment. Implementation and management of the Horticulture CRSP was awarded to the University of California, Davis and its partners, Cornell University, University of Hawai'i and North Carolina State University.

The purpose of Horticulture CRSP is to reduce poverty and hunger of the rural poor in developing countries through horticulture. Horticulture has the capability to provide a diverse cropping system, provide healthy and nutritious food, and to provide an increased income to smallholder farmers. With the themes of innovative technology, gender equity, access to information, and building local human and institutional capacity, the Horticulture CRSP Managing Entity designed and developed a Program that utilized existing technologies and expertise throughout the U.S. Land Grant System to collaborate with developing country expertise to initiate Immediate Impact Projects (IIPs). These 15 IIPs were established in 20 countries with leadership from ten 1862 and 1890 Land Grant Universities. As we move into 2010-11, fifteen more projects will be added.

The Horticulture CRSP has implemented a large number of projects in a large number of countries, engaging a large number of U.S. researchers and large numbers of in-country institutions and organizations. As such, it addresses rural poverty and hunger in a large number of international communities while emphasizing the quantity of readily adaptable horticulture research knowledge and technology that already exists to solve poverty, nutrition, and health issues of the developing world. It also exemplifies the multiple ways that horticulture can address these issues:

- low cost but effective postharvest technologies - ranging from on-farm and local community cooling facilities to solar drying of fruits and vegetables for preserving quality - that quickly reduce the amount of fruits and vegetables that are lost before human consumption can occur - currently  $\geq 40\%$  in the 20 focus developing countries;
- new, low cost technology to maintain vegetable seed quality and thus providing smallholder farmers the opportunity to achieve the full genetic potential for production; and
- introduction of new horticulture crops, including development of production methodologies, that enhance human nutrition and/or enable high value cash crops – e.g. orange flesh sweet potatoes, indigenous leafy green African vegetables, herbs/spices/medicinal plants.

To enable the Horticulture CRSP Theme of Information Technology, a web-based Knowledge Bank was constructed, with continual additions and improvements. Compiling horticulture knowledge, in cooperation with the Global Horticulture Initiative, the UC Davis International Programs Office, and numerous other established organizations and institutions provides the

opportunity to access information and solutions to a myriad of needs and opportunities. Platforms for utilization of the Knowledge Bank include Regional Centers of Excellence, being developed in South Asia, Southeast Asia, East Africa, West Africa, and Latin America. Community Development is an essential component to adaptation and adoption of new technologies and application of known information. Newsletters, social networking technologies, and other electronic forms of information dissemination are being used.

Our Theme of Gender Equity is essential to make certain that small holder women farmers are included in all aspects of the Program. Women, who are the primary horticulture farmers in many areas of the developing world, are the primary “clienteles” of all Horticulture CRSP projects.

The Theme of ‘Leapfrog’, Innovative Technologies ensure that smallholder farmers have access to the most modern technologies but at an appropriate scale and cost. The “Cool-bot™” produce cooler, seed drying beads, solar dryers, and orange flesh sweet potato flour are a few examples that were introduced during this first year.

The USAID Collaborative Research Support Programs are unique in that they have a strong research component and they emphasize human and institutional “Capacity Building”. Both are foundation components for communities and countries to become self-sufficient in developing, delivering and implementing horticulture information and technologies and not depend upon external inputs indefinitely. Thus, all Horticulture CRSP projects conduct adaptive research in the local communities with local and national collaboration and leadership. All projects include training of graduate students, scientists, academics, farmers, and local leaders. Projects and the technologies developed or used are reviewed for their local success and also their potential to be broadly adapted, scaled, and for long term sustainability. Linkages with the private sector are an important component of this large scale adaptability and long term sustainability.

The Horticulture CRSP is fortunate to have a dedicated and talented Management Entity staff at UC Davis; a combination of experienced and internationally regarded academics, exceptional support staff, and enthusiastic graduate students. Our partner Universities bring a complementary experience in geographic and subject matter as well as a proven long term commitment to international agriculture. The International Advisory Board members bring individual credentials of greatest repute, international experience, academic status, and diverse international backgrounds.

The following components of this first Horticulture CRSP Annual Report describe the efforts and progress in this first year. We welcome comments, critiques, and suggestions.

HORTICULTURE CRSP IMPACTS

15 projects began on 1 February 2010

10 university project partners

Colorado State University; North Carolina State University; Purdue University; Rutgers, The State University of New Jersey; The Ohio State University; Tuskegee University; University of California, Davis; University of Florida; University of Hawaii at Manoa; and University of Wisconsin, Madison

20 countries served

Africa: Ghana, Kenya, Nigeria, South Africa, Tanzania, Uganda, and Zambia  
Latin America: Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, and Panama  
South and Southeast Asia: India, Nepal, Sri Lanka, and Thailand

2,293 people trained (55% women).

1,418 rural households reached.

241 new technologies under research.

Program Highlights

- Explored potential to export cut flowers from Honduras using existing fruit exporters and improved storage technology.
- Increased consumer awareness of the nutritional and cultural importance of orange-fleshed sweetpotato to increase food security, nutrient intake, and incomes in Ghana.
- Improved techniques to dry and store seeds where temperatures and average relative humidity are problematic in India, Nepal, and Thailand using available resources.
- Identified food and plant safety problems in tomato in Nigeria and developed a Good Agricultural Practices education system and transfer to farmers.
- Determined the effectiveness of different coating and essential oils in controlling postharvest disease of mango and papaya and maintaining fruit quality in Sri Lanka.
- Increased access to fair trade and other markets for Rooibos tea farmers in South Africa.
- Used solar power and improved cooling to create storage coolrooms and transport where electricity and infrastructure are limited in India, Uganda, and Honduras.
- Deployed rapid diagnostic tools to detect *Phytophthora* disease on horticultural crops in El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, and Mexico.
- Trained bell pepper farmers in current and best management practices to improve production and postharvest quality in Nicaragua, Haiti, Honduras, Dominican Republic, and Costa Rica.
- Expanded nursery facilities, created demonstration gardens, and developed Farmer Field Schools to promote fruit and vegetable production in Uganda.
- Introduced and evaluated appropriate and disease resistant vegetable varieties in El Salvador, Honduras, and Nicaragua.
- Increased the production base of important indigenous spices, medicinal plants and horticultural crops and provided employment and income to farmers from Ghana.
- Helped farmers in Zambia develop consistent vegetable products to market to hotels and other tourist serving industries.
- Established greater production and use of indigenous vegetables that in the long-term will provide a source of food for economic security and improved nutrition for Kenyans.
- Developed a concentrated solar drying unit for mango and tomato in Tanzania.



## HORTICULTURE CRSP AND USAID'S FEED THE FUTURE INITIATIVE

The Feed the Future (FTF) initiative envisages agriculture as a major tool for increasing the incomes of the rural poor, and thereby improving their nutrition, health, education and economic well-being. The primary beneficiaries for this effort include the 28 million people currently living on incomes of less than \$2 per day and the 13 million people living in extreme poverty on less than \$1.25 per day.

USAID's Horticulture Collaborative Research Support Program (CRSP), funded in 2009, and managed by the University of California at Davis, uses the horticulture value chain to improve incomes, nutrition, health, and economic well being for the rural poor, particularly women.

- Empowering women with access to income
  - *Horticultural crop production offers particular opportunities for women, the growers of horticultural crops in the developing world, who share their resources with their children and communities.*
- Increasing household production of nutritious foods
  - *Horticultural crops reduce malnutrition by providing a diverse micronutrient-rich diet.*
- Dissemination of technical assistance
  - *The Hort CRSP harnesses the resources of the US public universities and partner institutions, agencies, and organizations in the developing world.*
- Increased agriculture value chain on-and off- farm
  - *Horticultural crops can provide more income and food for farm families from small plots of land.*
- Reducing postharvest losses of nutritious foods
  - *The Hort CRSP is committed to reducing the 40-80% postharvest loss of perishable food in the developing world.*
- Creating an enabling policy environment for agribusiness growth

Regional "Centers of Excellence" in 3 to 5 strategic locations will facilitate training and information exchange for farmers and horticultural professionals.

The Horticulture CRSP is prepared to assist in developing regional or country-specific plans or projects to address the Feed the Future initiative, and looks forward to the opportunity to work with USAID missions in amplifying the research of our collaborating teams.

LEADERSHIP AND INTERNATIONAL ADVISORY BOARD

*Ronald E. Voss and L. George Wilson*

Horticulture CRSP is managed by a diverse team of individuals with skills ranging from production to postharvest.

- Ronald E. Voss, Director
- Elizabeth J. Mitcham, Associate Director
- Michael S. Reid, Leader - Implementation of Innovative Technology and Special Projects
- Mark A. Bell, Leader - Communications and Information Transfer
- James E. Hill, Director of International Programs Office

The management team is supported by:

- Paul Marcotte, International Programs Office
- Amanda Crump, Executive Program Coordinator
- Diana Puccetti, Office and Event Planning Assistant
- Heather Kawakami, Accounting and Fiscal Management
- Sabrina Morgan, Accounting and Fiscal Management
- Rachel Abrenilla, International Programs Office
- Peter C. Shapland, Graduate Student-International Agricultural Development

United States University primary project partners are:

- Colorado State University
- Cornell University
- North Carolina State University
- Purdue University
- Rutgers, The State University of New Jersey
- University of Hawai'i at Manoa
- University of California, Davis
- University of Florida
- University of Wisconsin, Madison
- The Ohio State University
- Tuskegee University

International partners encompass all regions and include numerous farmers and leaders beyond the organizations listed below.

**Africa**

- Agribusiness in Sustainable Natural African Plant Products; Ghana, South Africa, and Zambia
- Ahmadu Bello University; Nigeria
- AVRDC, The World Vegetable Center; Tanzania
- Council for Scientific and Industrial Research; Ghana
- Food Research Institute; Ghana
- Kenya Agricultural Research Institute; Kenya
- Kwame Nkrumah University of Science and Technology; Ghana
- Ministry of Agriculture, Food Security, and Cooperatives; United Republic of Tanzania
- Moi University; Kenya
- Mukono District Council; Uganda
- Mukono Zonal Agricultural Research and Development Institute; Uganda
- Our Lady Queen of Apostles Nkokonjeru Parish; Uganda
- Reach Your Destiny Consult, Ltd.; Uganda

- Rural Agency for Sustainable Development; Uganda
- Sandra Kruger and Associates; South Africa
- Selasie Farms and Groceries; Ghana
- Stellenbosch University; South Africa
- Uganda Christian University; Uganda
- University of Cape Coast; Ghana
- University of Ghana; Ghana
- University of the Western Cape; South Africa

### Europe and United States

- Auburn University; United States
- Bent Creek Institute, The North Carolina Arboretum; United States
- Michigan State University; United States
- NovaFlora, Inc.; United States
- Plant Research International; The Netherlands
- Store It Cold, LLC; United States
- Tennessee State University; United States

### Latin America

- CARE; El Salvador
- Centro de Investigación Agropecuaria San Antonio; Nicaragua
- Corporación Dinant; Honduras
- Fundación Hondureña de Investigación Agrícola; Honduras
- Instituto Dominicano de Investigaciones Agropecuarias y Forestales; Dominican Republic
- Project Haiti WINNER; Haiti
- Universidad de Costa Rica; Costa Rica
- Universidad Nacional Agraria; Nicaragua
- Zamorano University; Honduras



Horticulture CRSP partners are crucial to project success.

### South and Southeast Asia

- Acharya N G Ranga Agricultural University; India
- Amity International Centre for Postharvest Technology and Cold Chain management; India
- AVRCD, The World Vegetable Center; Taiwan
- Industrial Technology Institute; Sri Lanka
- Link Natural Products Pvt. Ltd.; Sri Lanka
- Nepal Agricultural Research Council; Nepal
- Punjab Agricultural University; India
- Rhino Research; Thailand

The Horticulture Collaborative Research Support Program (CRSP) named members to its International Advisory Board (IAB) in spring 2010. This International Advisory Board (IAB) is the senior advisory council of the Horticulture CRSP. The Purpose and Role of the Horticulture CRSP International Advisory Board are to advise the Management Entity (ME) on all major aspects of the program, including setting priorities, sub-award RFAs, technical and management

approach implementation, budget allocation and ensuring that USAID, Global Horticulture Assessment (GHA) and Horticulture CRSP objectives are met.

The membership of the International Advisory Board ranges from 8 to 12 and are representative of the major geographical regions, Horticulture CRSP partner universities and other U.S. and international Universities, international agriculture research centers, and the private sector, with the Horticulture CRSP Management Entity and USAID serving as ex officio members. During the first year of the Hort CRSP, eight distinguished members of the international / university / private industry were appointed.

#### Members of the International Advisory Board

##### *L. George Wilson, Ph.D., Chair*

George Wilson is Professor of Horticultural Science at North Carolina State University. He was the Senior Advisor for University Relations and Agriculture Research, Training and Outreach in the Office of Agriculture of USAID/Washington and the North Carolina State University Chief of Party for the USAID Agricultural Technology Transformation Project in Peru.

##### *Lusike A. Wasilwa, Ph.D., Vice Chair*

Lusike Wasilwa is Assistant Director in charge of the Horticulture and Industrial Crops Division at the Kenya Agriculture Research Institute.

##### *Deborah Pierson Delmer, Ph.D.*

Deborah Delmer is Private Consultant to foundations and government agencies in the areas of plant biotechnology. She is Professor Emeritus in Plant Biology, University of California, Davis; former Program Director, BREAD program of U.S. National Science Foundation; former Associate Director for Food Security for The Rockefeller Foundation; and former Chair of Plant Biology, University of California, Davis.

##### *Adel A. Kader, Ph.D.*

Adel Kader is Professor Emeritus of Postharvest Physiology in the Department of Plant Sciences, University of California, Davis.

##### *Poonpipope Kasemsap, Ph.D.*

Poonpipope Kasemsap is Associate Professor of Crop Eco-Physiology, Chair of the Horticulture Department, and Director of the International Studies Center at Kasetsart University in Bangkok, Thailand.

##### *J.D.H. Keatinge, Ph.D.*

Dyno Keatinge is the Director General of AVRDC - The World Vegetable Research and Development Center based in Taiwan and Vice-Chairman of the Global Horticultural Initiative.

##### *Norman E. Looney, Ph.D.*

Norman Looney is President of the International Society for Horticultural Science and is Board Chair of the Board of Directors of the Global Horticulture Initiative.

##### *Howard Yana Shapiro, Ph.D.*

Dr. Shapiro is Corporate Staff Officer of Plant Science and External Affairs at Mars, Inc. and an Adjunct Professor in the Department of Plant Sciences at University of California, Davis.

The USAID Administrative Officer, and also an ex officio member of the IAB, is Larry Paulson.

The International Advisory Board met once during 2009-2010, in Singapore immediately following the Inception Workshop, April 2010. At that meeting, the Board provided general and specific recommendations to the Managing Entity on content and format of annual conferences, linkages with USAID Missions, capacity building of institutions, project priorities, sustaining

projects after Horticulture CRSP funding ends, regional centers of excellence, information management, linkages with CGIAR system and projects, linkage with nutrition and health, and linkage with the Global Horticulture Initiative.

An unofficial meeting, but with the majority present, of the IAB met at the International Horticulture Congress in Lisbon, Portugal, August 2010. The next annual IAB meeting will be held following the 2011 Spring Conference at University of California, Davis.

Horticulture CRSP IAB Chair George Wilson has participated in the Horticulture CRSP Management Entity weekly staff meetings and thus provided a consistent presence of Advisory Board guidance and experience. IAB members also formally represented Horticulture CRSP at several professional society and international development meetings. This included Poonpipope Kasemsap at the Indian Horticulture Congress, and George Wilson at an FAO sponsored agriculture-nutrition workshop. Program Council and Horticulture CRSP University Partner representative from the University of Hawaii, Robert Paull, represented the Horticulture CRSP at the APAARI Consultation Meeting on Postharvest and Value Addition on Horticultural Produce in Malaysia.

## REGIONAL ACTIVITIES AND BENEFITS

**Africa**

Horticulture CRSP had nine projects with activities in Africa. Projects tackled a variety of issues ranging from postharvest processing and storage to promotion of indigenous vegetables. Notable activities were:

- 1) the design of an improved solar dryer for use in cloudy climates,
- 2) testing of consumer confidence in orange-fleshed sweetpotato bakery products,
- 3) survey of food safety issues and development of Good Agricultural Practices associated with problems found,
- 4) increasing market access for Rooibos farmers through alternative and fair trade markets,
- 5) testing coolrooms powered by the sun,
- 6) using a Farmer Field School approach to improving local nutrition,
- 7) working with farmers to open export markets for horticultural crops,
- 8) harnessing the power of the tourism industry to open new domestic markets for fruits and vegetables, and
- 9) promoting the status and production of indigenous African leafy vegetables that are high in nutrition.



Locations of Horticulture CRSP projects in Africa.

**Latin America**

Work in Latin America focused on five projects that explored new markets, production practices, and crops. Horticulture CRSP collaborators were able to:

- 1) test potential export processes for cut flowers from Honduras to the United States,
- 2) teach rapid disease detection methods to extension educators,
- 3) conduct regional workshops on using protective structures to improve production of perishable vegetables,
- 4) use innovative technologies to cool crops inexpensively, and
- 5) test vegetable varieties and encourage the adoption of new varieties and crops.



Locations of Horticulture CRSP projects in Latin America.

### South and Southeast Asia

Three Horticulture CRSP projects had activities in Asia and each project confronted postharvest issues in a unique way. These projects:

- 1) used commonly found materials and novel drying techniques to develop better seed drying and storage,
- 2) determined the effectiveness of different coatings in controlling postharvest disease of mango and papaya, and
- 3) introduced improved coolrooms and cool transport for small-scale farmers.



Locations of Horticulture CRSP projects in South and Southeast Asia.

## SECTION TWO - THEMES

### INNOVATIVE TECHNOLOGY

*Michael S. Reid, Leader of Implementation of Innovative Technology and Special Projects*

The Horticulture CRSP encourages projects that explore 'disruptive' or 'leapfrog' technologies providing advanced tools, in an appropriate form, to stimulate and facilitate horticultural development in the developing world. Thus far, we are supporting projects that test novel concentrators for solar drying, electronic controllers to provide low-cost coolrooms based on window air conditioners, and Zeolite beads for rapid drying of seeds and other horticultural products. Future emphases will include innovation in cool transport technologies, evaluation of molecular genetic approaches to improving production, postharvest, and nutritional characteristics of important horticultural crops, and testing the value of photovoltaics in pumping, desalination, and other energy-intensive horticultural operations. As projects are progressing, we are developing strategies to expand the scalability of those technologies that are demonstrated to be successful.

### INFORMATION ACCESS

*Mark A. Bell, Leader of Communications and Information Transfer*

*Amanda Crump, Executive Program Coordinator*

*Peter C. Shapland, Graduate Assistant*

*Dylan Owen, Undergraduate Assistant*

"Knowledge is Power" Sir Francis Bacon (1561-1626).

Recognizing the power of knowledge to change lives, the Horticulture CRSP has made horticulture information dissemination one of its priorities. The Horticulture CRSP structured its approach to information management around the information needs of two sets of the primary target groups, namely:

- Researchers, development and extension workers, and
- Donor organizations (especially USAID).

The information management strategy of Horticulture CRSP aims to get knowledge into the hands of those that can benefit and identifies the type of information they seek (Appendix I).

As such, while researchers will be seeking funds to implement their needs-driven research, Horticulture CRSP also recognizes a series of development and extension intermediaries - the frontline workers and horticultural chain players – who will ultimately provide information and benefits to the poor farmers and small scale businessmen. These latter groups are the targeted beneficiaries of Horticulture CRSP activities, but they can only be reached by successfully engaging development and extension intermediaries. Ultimately, by providing information to more efficiently and safely produce food, both farmers and consumers will benefit.

The information strategy has sought to capitalize on the power of the internet. In this respect, the project website (<http://hortcrsp.ucdavis.edu>) and the Global Horticulture Knowledge Bank (<http://hortkb.weebly.com>) are two central tools to support our information dissemination strategy.



### Global Horticulture Knowledge Bank

The knowledge bank (<http://hortkb.weebly.com>) builds off the success of similar, problem-solving, internet-based tools like IRRI's Rice Doctor (Figure 1). The knowledge bank provides practical crop information to help extension and development workers improve the lives of people in lesser developed countries. The website is demand-driven and aimed at intermediary practitioners working in developing countries. It adds value to and builds off existing credible information and it focuses on practical 'how to' information in all horticultural topics including diagnostics, energy, GIS, and markets.

## Global Horticulture Knowledge Bank

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[HOME](#)    [COLLABORATE](#)    [FEEDBACK](#)    [NEXT STEPS](#)    [DISCLAIMER](#)    [ABOUT US](#)



**Horticulture for Development.** This Knowledge Bank provides practical horticulture information - to help extension and development workers - improve the lives of people in lesser developed countries. Use the links below.

 <p>Hort Hospital</p>	 <p>Hort Practices</p>	 <p>Market Master</p>	 <p>GIS</p>
Diagnose crop problems <a href="#">Link</a>	Produce and handle crops <a href="#">Link</a>	Develop markets <a href="#">Link</a>	Use GIS in agriculture <a href="#">Link</a>
 <p>Energy in Ag</p>	 <p>Small Business</p>	 <p>Extension</p>	 <p>Project Evaluation</p>
Energy for small farms <a href="#">Link</a>	Develop your business <a href="#">Link</a>	Deliver your message <a href="#">Link</a>	Evaluate activities <a href="#">Link</a>

This site

- is developed to provide people working on Horticulture in lesser developed countries with practical information.
- links to existing materials and develops new materials as needed.
- is a project of International Programs of the College of Agricultural and Environmental Sciences at UC Davis.

Figure 1. Global Horticulture Knowledge Bank website front page.

### Website

The Horticulture CRSP website (<http://hortcrsp.ucdavis.edu>) is a tool for practitioners (Figure 2). Including providing information about funding and horticulture CRSP projects. We have designed useful web tools to facilitate partnerships, created a map tool for people to view horticultural development projects, and provided information on horticulture and development

activities and resources. The website received over 10,000 hits from 4,305 visitors in 124 countries (Appendix II). A future effort will be to encourage the development of text-less, interactive information to overcome the literacy barrier that stands between the rural poor and the wealth of information on the web.

Sample pages that exhibit the goals of Horticulture CRSP:

Find a Collaborator - [http://hortcrsp.ucdavis.edu/main/find\\_partner.html](http://hortcrsp.ucdavis.edu/main/find_partner.html)

Project Overview - <http://hortcrsp.ucdavis.edu/main/IIPMap.html>

Information Portal - [http://hortcrsp.ucdavis.edu/main/info\\_portal.htm](http://hortcrsp.ucdavis.edu/main/info_portal.htm)



Figure 2. Horticulture CRSP website front page.

### *Mapping Global Horticulture Development Projects*

The goal of this project (<http://hortcrsp.ucdavis.edu/main/worldprojects.html>) is to create an online resource that enables funding agencies and project creators to learn about past and present projects, find potential project linkages and identify areas of need. In international agricultural development, donors and project creators are often unfamiliar with completed and ongoing projects. They often do not know about innovative projects that take place in other parts of the world, which could be applicable to their development goals.

A series of maps composed of 2,048 project placemarks of 1,427 unique horticultural projects was created. By April 2011, the maps will be searchable by keyword, crop, location, or project theme – sustainable production, market access, food safety, pest management, postharvest or germplasm.

This ongoing effort has created two types of interactive web-based maps, ongoing and completed projects. The map of current projects enables donors, researchers and development workers to

find out who is active, build collaborations, and create complementary projects. The map of completed projects provides a better understanding of what work has been done in a given country or region. The intent is not only to provide an overview, but also to enable visitors to access detailed information on individual projects, seek out past project implementers, and learn about what worked and what did not.

Each project placemark contains a description of the project, the crop, location, the implementation date, the implementing organization, and a link to more information or the email address of the project implementers.

#### *Newsletters and Articles*

The Horticulture CRSP Information Management team created newsletters and articles for the promotion of our programs (Appendix III).

#### GENDER EQUITY

*Elizabeth J. Mitcham, Associate Director*

*Amanda Crump, Executive Program Coordinator*

Horticultural crop production and marketing are frequently women's work in many, but not all, developing countries. Gender equity is an important theme of all Horticulture CRSP activities and we strive to afford opportunities for women to improve their livelihoods as a result of our projects. Women with increased opportunities advance the well-being of their families and communities due to greater daily cash flow, investment in the family, improved nutrition and access to health care, and improved education for their children. With their acquisition of business skills and market share, profits are turned to enterprise growth, equipment and



Women perform much of the farm labor in developing countries.

transportation, and they may even be able to increase employment for both men and women. Successful programs ensure that women are empowered and gain respect from family, community, and business associates. As required by USAID, all Horticulture CRSP projects are required to be gender sensitive and to strive for inclusion of women as 50% of beneficiaries in all areas of the project. We expect our project leaders to look for a creative way around constraints that are identified. Such constraints might include the ability of women to travel outside their immediate area for training and meetings, social taboos

related to interacting with men, and the ability of women to access resources and finance. Gender constraints also exist in regard to scientists, extension agents and students, including differences in men's and women's perspectives, and there may be fewer women to include in various projects. Horticulture CRSP has exceeded its goals by training more women than men in sustainable agriculture, marketing, and postharvest in 2010.

## CAPACITY BUILDING

*Elizabeth J. Mitcham, Associate Director*

Horticulture CRSP projects have encouraged the development of grower associations and cooperatives within and between regions, and facilitated the training of these groups. Regular meetings have promoted effective transfer of knowledge and experience among the groups. In some regions, women-only groups have been engaged to ensure active participation by and empowerment of women. Several projects include ‘train-the-trainers’ programs that allow the knowledge to be extended to much greater numbers of individuals. The trainers are encouraged to be leaders in their areas, meeting regularly with other members and faculty and particularly with local extension agents and NGOs to share knowledge and experience within and across regions. Graduate students from the U.S. and from developing countries have been included in our projects, gaining valuable horticulture, research, extension, and development experience.



Capacity building is a critical pillar of Horticulture CRSP.

A number of avenues have been used for training, including the following:

- Courses and Workshops
  - Train-the-trainer and extension methodology courses in-country or in the U.S. for faculty, universities, and other partners (NGOs and the private sector)
  - Short courses and technical field programs – Participants undertake short term study in the USA, engaging with and visiting local industry and production environments to learn best practices and expand their knowledge horizons.
  - Local workshops on specific topics –workshops included a number of local to highlight their expertise.
- Demonstrations
  - Highlight the experience and knowledge (including indigenous knowledge of horticultural crops) of local farmers, particularly women.
  - Extend knowledge gained to other farmers.
  - Discuss successes and failures, obstacles, and strategies for improvement.

## **SECTION THREE - IMMEDIATE IMPACT PROJECTS**

### **OVERVIEW AND INTRODUCTION**

Horticulture CRSP awarded nearly \$2 million to support 15 one-year projects to improve the production and marketing of horticultural crops and products developing countries. The collaborative research effort is responsible for a broad range of activities demonstrating how horticulture can reduce hunger and malnutrition and raise the incomes of the rural poor. Ten universities conducted projects in 20 developing countries. These projects will be completed in spring 2011. The following reports coincide with six to eight months of work on each project.

PROJECT SUMMARIES BY PRIORITY ISSUE  
Sustainable Crop Production

*I. Deployment of rapid diagnostic tools for Phytophthora on horticultural crops in Central America*

Implementing Team: Dr. Jean Beagle Ristaino, Dr. Monica Blanco, Dr. Luis Gomez, Dr. Jose Melgar, Dr. Kelly Ivors, Dr. Peter Bonants, Dr. Carrie Harmon,

Report Submitted By: Dr. Jean Beagle Ristaino



Workshops have been conducted on rapid diagnostics of *Phytophthora* spp.

Crops: cacao, potato and root and floriculture crops

Countries: El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, and Mexico

Project Objectives

To deploy a series of 'shovel ready' technologies described in detail below including: organizing a *Phytophthora* diagnostics workshop and deploying a *Phytophthora* Lucid key, a protocols book, molecular and digital diagnostic identification systems and a survey to identify *Phytophthora* species on cacao, potato and root and floriculture crops and improve the diagnostic capabilities for important plant disease clinics in the region.

Objective 1. Conduct a regional *Phytophthora* diagnostic workshop at the Universidad de Costa Rica and provide training in traditional morphological and molecular identification of *Phytophthora* species.

Objective 2. Deploy field based detection methods in Central American plant disease clinics for species identification in the genus *Phytophthora* including:

- a. A computer based Lucid key for identification of common species of *Phytophthora*
- b. PCR methodologies, and Padlock probes (PLP's) and Cloneddiag microarrays for common and high threat species of *Phytophthora*;

Objective 3. Use the morphological and molecular tools and conduct field surveys at NGO's, industry, and small farms managed by both women and men, to identify the major *Phytophthora* species of responsible for significant losses on horticultural crops in including cacao, potato and root crops and floricultural crops in Honduras and Costa Rica.

### Project Summary

Plant disease is a limiting factor in agricultural production in Latin America. Plant pathogens cause losses estimated to be as high as \$30 billion per year. The risk of introduction of *Phytophthora* species with trade requires continued monitoring and improved diagnostic capabilities.

### Major Activities and Key Outputs

The objective of this project is to produce a platform of tools needed to detect, identify, and ultimately prevent spread of species of *Phytophthora* with a major focus on common and high threat species of *Phytophthora* on horticultural crops from Central America. During the second quarter of the project, we held a *Phytophthora* diagnostics workshop and have deployed a series of technologies including: a protocols book, a *Phytophthora* Lucid key, and molecular tools for identification for use in the diagnostic labs throughout the region. Two digital diagnostic camera systems were given to the hub laboratories at Laboratorio de Técnicas Moleculares aplicadas a la Fitoproteccion, Fundación Hondureña de Investigación Agrícola (FHIA) and Centro de Investigaciones en Protección de Cultivos, Escuela de Agronomía, Universidad de Costa Rica (CIPROC-UCR). These cameras will be used to send disease plant and pathogen images to NC States Plant Disease and Insect Clinic to improve identification of *Phytophthora* species on important crops in Central America.

### Summarized Approach to Creating Impact

The workshop on “Rapid Diagnostics Tools for *Phytophthora* on Horticultural Crops” was held June 28-July 2 in San Jose Costa Rica. The workshop was filled to capacity and there was a long wait list. There were 14 female and 10 male participants from 9 countries including Mexico, El Salvador, Honduras, Nicaragua, Panama, Costa Rica, Chile and Peru. A hub diagnostic lab at Laboratorio de Técnicas Moleculares aplicadas a la Fitoproteccion, Centro de Investigaciones en Protección de Cultivos, Escuela de Agronomía, Universidad de Costa Rica and a second hub diagnostic lab at Departamento de Protección Vegetal, Fundación Hondureña de Investigación Agrícola, La Lima, Cortes Honduras will receive funds to purchase equipment and will coordinate collection of the *Phytophthora* survey data in each country and among workshop participants in the region.

### Impact

We now plan to work via FHIA in Honduras, the UCR, Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), The World Cocoa Foundation, DOLE Fresh Fruit International, and the Organization of Tropical Studies to conduct a survey of *Phytophthora* species on cacao, potato and horticultural crops. The accurate identification of *Phytophthora* has important implications for growers in Latin America and the US. We have formed the Latin American *Phytophthora* Diagnostic Network (LAPDN) and have created a site on Facebook to facilitate discussions among workshop participants. Plans are underway for a second workshop to be held tentatively at the International Potato Center (CIP) in Lima Peru. Improved management of plant diseases will lead to more sustainable horticultural trade and export capacity. In the second quarter of the project we conducted the workshop and trained 24 diagnosticians that will work with small farmers in their regions.

A workshop on the "Deployment of rapid diagnostic tools for *Phytophthora* on agricultural crops in Central America" was held June 28-July 2. The workshop organized by Jean Beagle Ristaino and Monica Blanco was a joint initiative of North Carolina State University, University of Costa Rica, Plant Research International, Wageningen and the Honduran Foundation for Research. Centro Agronómico Tropical de Investigación y Enseñanza (CATIE, Wilberth Phillips and

Muriela Leandro) assisted with sample collection for the workshop. World Cocoa Foundation, the Global Plant Clinic and CABI provided names of prospective students. Dole Foods sent an employee who was recently hired to work on *Phytophthora* on pineapples. The development of the course was made possible through funding from the Partnership Program for Support and Research in Horticulture (Hort CRSP) coordinated by the University of California, Davis and the U.S. Agency for International Development (USAID).

The course brought together 24 plant pathologists (14 female and 10 male) from government agencies, private companies, public and private universities in 9 countries in Central and South America including El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Mexico, Peru, and Chile. Instructors included Dr. Jean Ristaino, Dr. Monica Blanco, Dr. Luis Gomez, Dr. Kelly Ivors and Dr. Peter Bonants. Materials were also provided by Dr. Barbara Shew of NC State and Ms. Carrie Harmon of SPDN at UFL, and Dr. Francisco Avila from AgDia. During the week, participants learned a number of "rapid" technologies to analyze and identify species of *Phytophthora* using morphological and molecular methods. In addition, the workshop participants are now part of a diagnostic network in the region called "The Latin American *Phytophthora* Diagnostic Network". Our goal "to improve and build scientific capacity in plant disease diagnostics between the laboratories of Central America and Mexico and improve communications with laboratories in the United States" has been achieved. The ambitious agenda for the workshop spanned from isolation of *Phytophthora* from plants samples and water to morphological and molecular diagnostics. A detailed protocols workbook developed and distributed to students. Pairs of students were given an "unknown species" which they ran through the series of experiments during the week to make a correct species identification.

Each student was given a USB drive containing resources needed to set up their individual laboratories for *Phytophthora* diagnosis. Many of the students had not met each other prior to the workshop and are working in similar diagnostics clinics in their respective countries. There were daily luncheons and dinners that allowed students both formal and informal time to meet and network.

There are now 24 trained diagnosticians back in their home institutions with capabilities to conduct plant pathogen diagnostics. See attached list of participants. Two hub labs at Centro de Investigaciones en Protección de Cultivos, Escuela de Agronomía, Universidad de Costa Rica and a second hub lab at Departamento de Protección Vegetal, Fundación Hondureña de Investigación Agrícola, La Lima, Cortes, Honduras have now signed their subaward agreements and are to receive funds to conduct research and purchase equipment and will coordinate collection of *Phytophthora* survey data in their region.

- a. A computer based Lucid key for identification of common species of *Phytophthora*. Each participant in the workshop was given a copy of the "Lucid key to the Common species of *Phytophthora*" developed by Jean Ristaino at NC State and practiced using the key during the workshop. A beta version of the key was distributed. The key is now in final stages of review by APS Press and a final copy of the key will be distributed to workshop participants later this year.
- a. PCR methodologies, and Padlock probes (PLP's) and Cloneddiag microarrays for common and high threat species of *Phytophthora*. A detailed protocols workbook was developed and distributed to students. Students learned a rapid PCR method for identification of *Phytophthora infestans* and an RFLP PCR methodology for identification of many different species. Quick ELISA based immunoassays were also demonstrated. Real time PCR using an all *Phytophthora* primers and probe followed by specific Padlock probes (PLPs) were also demonstrated.



Use the morphological and molecular tools and conduct field surveys at NGO's, industry, and small farms managed by both women and men, to identify the major *Phytophthora* species of responsible for significant losses on horticultural crops in including cacao, potato and root crops and floricultural crops in Honduras and Costa Rica.

- a. The FHIA lab collected 17 cacao samples, 6 potato samples, 17 citrus samples, 6 tuber samples and 17 samples of ornamentals and are in the process of isolating *Phytophthora* from Citrus, tubers and ornamentals. Microscopic observations of *Phytophthora* of the 6 potato samples has been done but isolation in media is still underway. From the cacao samples we have made observations of *Phytophthora* from 12 out of 17 samples. We are in the process of isolating the pathogen in media.
- b. A student, Oscar Cordoba, from the National University of Agriculture is doing his research working on this activity.
- c. FHIA will purchase a microscope and other laboratory equipment as part of this project.
- d. We have collected 10 cacao samples, 1 pineapple sample and 3 vegetable samples. These samples are coming from all around the country since they are received at the diagnostic lab. The pathogen has been isolated from all the samples on media and DNA extraction has been performed. We are working on RFLPs and sequencing of ribosomal region for the identification. In the third and fourth quarters of the project we plan to expand the sampling by using FTA collection cards for *Phytophthora infestans*. DNA will be sent to NC State for sequencing.

*II. Improving fruit postharvest quality through best management practices for perishable vegetable production in protective structures*

Implementing Team: Bielinski M. Santos, Teresa P. Salamé, Maricruz Ramírez-Sánchez, Craig D. Stanley and Jack E. Rechcigl.

Report Submitted By: Bielinski M. Santos

Crop: Bell Peppers.

Countries: Nicaragua, Haiti, Honduras, Dominican Republic, and Costa Rica.

Project Objectives:

The main goal of the project is to implement technologies to enhance bell pepper fruit yields and postharvest quality and to develop a comprehensive education and research network for protected agriculture information exchange among developing countries in Central America and the Caribbean.

Problems Addressed:

- Low yield and low pepper fruit quality.
- Lack of information on production under protective structures.
- Lack of training opportunities for new stakeholders and women in protected agriculture.

Major Activities and Key Outputs

- 11 on-going trials on different cultural practices on protected agriculture to improve yield and pepper fruit quality.
- Elaboration of 2 newsletters and 1 outreach document to be included in the PAINet website to share information on protected agriculture.
- One training for new stakeholders, including 12 women and 18 men on protected agriculture.

Summarized Approach to Creating Impact:

- One workshop in Nicaragua on protected agriculture.
- 2 newsletters prepared sent to cooperators in 7 countries in Central America and the Caribbean.
- Technologies tested on trials being already incorporated on regular management practices.

*III. Sustainable production of specialty horticultural crops in Ghana for income generation and increased export value*

Implementing Team: James Simon, Rutgers. Dan Acquaye, ASNAPP Coordinator.  
Charles Quansah, ASNAPP Ghana Research Coordinator

Report Submitted By: James Simon

Crops: Voacanga, griffonia, grains of paradise (GOP), xylopia, African birds eye chili (BEC), African nutmeg, and shea butter

Country: Ghana

Project Objectives:

1. Increase the production base of important indigenous spices, medicinal plants and horticultural crops (Grains of Paradise, African Birds Eye Chilies, Black Pepper and Voacanga) that leads to increased employment and income to farmers and communities;
2. Implement sustainable collection practices of selected wild harvested Non Timber Forest Products (NTFPs) to generate complementary income;
3. Increase productivity through applied research, improved quality systems and technology transfer;
4. Increase human and enterprise capacities using these crops as the economic driver; and
5. Trade facilitation and market development to increased regional and export trade.

Project Summary:

Objective 1 – Increase the production base of important indigenous spices, medicinal plants and horticultural crops (Grains of Paradise, African Birds Eye Chili and Voacanga) and provide employment and income to selected farmers.

Seedling production and nurseries:

- Imported 90,000 high quality BEC seeds from South Africa to support 10 acre farm establishment
- 10,000 GOP seedlings and 1,000 Voacanga seedlings have been raised at the existing nursery (constructed under the ICCO supported project)
- Arrangements made in GOP growing communities to secure additional 50,000 GOP planting materials
- 2,000 Voacanga, 73,120 GOP, and 27,500-BEC seedlings distributed to farmers for establishment of 60 acres farm.



African birds eye chili drying at the market.

Crop production practices and farm management.

- 60 farmers have been identified, introduced to the economic potentials of the NTFPs and Good Agricultural Practices
- Follow up training on Good Agricultural Practices organized to reaffirm the guiding principles for farm establishment and maintenance to the farmers.

Economic assessment of each crop.

- Draft crop budgets for 3 horticultural crops developed

Objective 2 – Implement sustainable collection practices of selected wild harvested NTFPs including Griffonia, Voacanga and Kombo to generate complementary income.

Promote sustainable wild collection practices of Griffonia, Voacanga and Kombo.

- Sensitized and trained six communities within the project area on sustainable collection practices for Griffonia and Kombo nuts and the assisted them to set up quality infrastructure systems for the processing of the NTFPs
- Directly worked with collectors and agents to mobilize 15MT of Griffonia valued at \$225,000 for 2 exporters
- Facilitated the purchase of 30MT of Griffonia seeds (valued at \$450,000) by two leading agents of Botanical Products Association of Ghana (BOTPAG)
- Purchased 12 MT of Kombo nuts valued at over \$4,000 within and around the project communities for processing into 4MT of kombo butter by Begoro (Valued at \$12,000)
- Activities generated 350 direct jobs (225 Males and 125 Females)
- Sensitized and trained 132 collectors on Good Collection Practices (GCP) in 4 of the project communities. The collectors were organized and prepared for the upcoming purchasing season (August-September)

Objective 3 – Increase productivity through applied research, improved quality systems and technology transfer.

Develop technical capacity of public institutions to conduct research in support of commercialization efforts.

- Some horticultural products propagated at the genebank at KNUST
- Propagation trials for the selected horticultural products has commenced under the newly refurbished lathhouse.

Involve institutions to field test and technology transfer on quality system implementation

- Appropriate propagation technology for GOP and Voacanga identified through research trials (by researchers and ASNAPP) and indigenous knowledge and practices by farmers
- Developed and reviewed production guides and crop profiles for the selected Horticultural products
- Appropriate harvesting/collection and drying technologies for Griffonia, Kombo and Voacanga transferred to collectors within the project area through a collaborative effort between ASNAPP and its implementing partner (RUDEYA)

Objective 4 – Increase human and enterprise capacities.

Build the capacity of farmers and collectors on good agricultural/collection practices (GAP, GCP), quality assurance and farm management.

- 302 Collectors and Agents sensitized and trained on Good Collection Practices
- 4 RUDEYA staff, 3 MOFA Staff and 1 Rural Enterprise Project (REP) staff trained on seedling multiplication and nursery management
- 60 farmers trained on introduction to horticultural products and Good Agricultural Practices

- Follow up training on Good Agricultural Practices organized for 60 farmers to reaffirm the guiding principles for farm establishment and maintenance to the farmers.

#### Objective 5 – Trade facilitation and market development.

##### Link farmers and collectors to buyers.

- Market secured for Griffonia and Kombo nuts with some outstanding orders not fulfilled due the raw material unavailability
- Begoro kombo processing group supported with a bore hole to produce high quality butter
- Quality systems developed for handling produce at the community level using existing structures. Jute sacks provided to support the mobilization of products.
- Tests (moisture content, microbial, ash etc) conducted and Certificate of analysis issued before products delivered to buyers to ensure conformity to market standards
- Logistics mobilized for distribution for the upcoming Voacanga purchases

##### Problems Addressed

The major natural plant products produced in West Africa are medicinal plants (Voacanga and Griffonia), spices (grains of paradise, Xylopia and African Birds Eye Chili) and plant-based butters (African nutmeg and shea butter).

The natural products industries in sub-Saharan Africa share many common challenges and impediments to growth. Commonality exists in terms of both domestic market expansion as well as international trade development (Adeleja et al., 2003, Acquaye et al., 2009). The natural product industry in Ghana employs over 10,000 collectors, 400 agents and 30 exporters but it is still characterized by low input-low output, mostly operated by small scale farmers (suppliers) with low levels of formal education and agricultural production knowledge. The industry lacks requisite supply volumes associated with poor product quality and irregular supplies (Govindasamy et al., 2006 and 2007). The development of quality standards (Juliani et al. 2008, Kim et al., 2009, Koroch et al. 2009 and Simon et al, 2007), information on the uses and applications and guidelines on good agricultural and collection practices (Weaver et al., 2008; WHO, 2004) are among the factors that can also contribute to the commercialization of Ghanaian products.

##### Major Activities and Key Outputs

This one-year Hort CRSP enables an expansion of activities to an additional 10 communities by supporting 50 farmers to cultivate an additional 20 acres of grains of paradise, 10 acres of African Birds Eye Chilies and 10 acres of Voacanga to ensure supply volumes for exporting containers of product. Also 200 collectors are trained to sustainably collect about 60 metric tons of selected wild harvested medicinal plants. Direct jobs are created for 250 farmers/collectors and income of \$232,000 generated and this project will assist in strengthening the overall product supply for export needs and thus enable the expansion and strengthening of this project in current and newer regions.

##### Summarized Approach to Creating Impact:

Rutgers and ASNAPP have used a strong science-based approach to develop grades and standards and improve quality for several such Ghanaian products to support commercialization efforts of medicinal plants and herbal teas such as lippia and others. In each case, the introduction of grades, standards, good agricultural practices (e.g. “Do’s and Don’ts for collectors and producers) lead to significant increases in quality and product improvement, which in turn

has led to increased market opportunities often at higher prices for the plant products. One of the major gaps in the commodity chain includes the availability and quality of the product that is in market demand and in establishing sustainable systems of collection and production, back-up technical support services, and ensuring close communication between the myriad of actors along the commodity chain. This project is specifically designed to strengthen those weaker areas or gaps in the commodity chain while strengthening the overall product supply and quality and ensuring profitability at the rural community level.

*IV. Sustainable development of horticultural crops in Zambia for food security, income generation and in support of the tourism industry*

**Implementing Team:** James Simon, Rutgers Bismarck Diawuo, Country Director, ASNAPP-Zambia. Elton Jefthas, Country Director, ASNAPP-South Africa, Stellenbosch University. Petrus Langenhoven, Agronomist / Greenhouse Specialist. ASNAPP-South Africa

**Report Submitted By:** James Simon

**Crops:** cabbage, carrots, egg plant, baby marrow, butternuts, green beans, sweet melon, watermelon, bulb onion, pumpkin, big tomato, and sweet pepper

**Country:** Zambia.

**Project Objectives:**

1. To train farmers in vegetable production
2. To increase production of high quality vegetables
3. To help producer groups understand conflict resolution practices
4. To ensure sustainability of the farmers' crop enterprises and assist them to approach horticulture production as an agri-business
5. To reduce the constraints (bottlenecks) faced by local farmers in the sale of vegetables. To increase the profit margin of farmers
6. To enable producer groups access larger markets and command premium for their produce
7. To train women farmers on oyster mushroom growing and commercialization

**Problems Addressed:**

The application of unsustainable agricultural practices in Zambia is reducing soil fertility and increasing erosion. The use of old technologies, poor quality germplasm, and the application of improper crop production practices are the main factors of reduced productivity. Consequently,



Horticulture CRSP projects focus on entire households.

farmers are producing less from a given piece of land and after home consumption they have little or nothing to sell. Quantities that are available for sale often do not meet the quality threshold established by the buyers, meaning the farmers receive little to no income to improve on their food security yet the expectations for quality and consistency are only increasing. At the farm level, horticulture places intensive demands on knowledge, management, and labor. While smallholder farmers have a great advantage in the low cost of their labor, they would gain greatly from greater knowledge of production/postharvest management

(Hichaambwa and Tschirley, 2006). In Southern Zambia (Livingstone and surrounding areas) the demand for assorted vegetables has been estimated at 270 metric tons per month. Yet, only 60

metric tons are now produced by local farmers in the surrounding regions and ASNAPP had a major role in introducing this volume of fresh produce. With an average price of \$1.25/kg, there is a \$262,000/month market potential which farmers in the selected communities could access with right quality produce. Since the gap is supplied by farmers as far as Lusaka and beyond with majority imported from South Africa, vegetable production has great potential to contribute to poverty alleviation and income generation and food security.

Major Activities and Key Outputs:

Objective 1: Technical assistance to producer groups in vegetable production and importance in varietal selection.

- a) Train farmers in nursery preparation and transplanting
- b) Techniques; demonstrate importance in varietal selection and seed quality.
- c) Provide training in sweet melon production has generated revenue for \$87,000 in 2008.  
Proper usage of fertilizers.
- d) Train farmers in manure and compost preparations to limit the use of chemical fertilizers and reduce farm input cost.
- e) Recommend proper and appropriate irrigation systems for the respective communities and train the farmers in their usage (treadle pump, water diversion, drip irrigation using gravity etc).
- f) Establishment of demonstration plots at farmer groups to transfer the latest production technologies on vegetable and mushroom production.
- g) Organize field days for farmers to exchange ideas.

Outputs Accomplished:

- 6 x 45 square meter greenhouses have been constructed for seedling production purposes but also to provide trainings to male and female farmers.
- Women and men participating in trainings increased from 68 to 80 for females and 32 to 55 for males for this quarter.
- The economic prospects of this project have attracted more women and men than initially expected and join the program.

Objective 2: Quality assurance/monitoring of producer groups

- a) QA/QC training for vegetable producers.
- b) Development of specification sheets for selected vegetables.
- c) Train farmers in postharvest handling of produce.
- d) Assist farmers to build rural infrastructure to dry and store their produce.

Outputs Accomplished:

- 135 farmers have (men (55) and women (80) have been trained in nursery management under the greenhouse environment.
- These structures will provide year round availability of planting materials for the farmers which for now is a major obstacle.
- 100 farmers currently involved in vegetable production were trained on food safety issues.
- 12 hectares being prepared to coincide with the raining season
- Improved management practices will be implemented during third quarter.

Objective 3: Conflict management and group dynamics training for producer groups:

- a) Strengthen group dynamics through farmers' participation in establishing group norms.
- b) Facilitate group to agree on reward and punishment systems in a participatory approach and also spell out dispute resolution mechanisms.



- c) Assist groups to elect leaders through elections.
- d) Assist groups to establish well defined communication systems.

Objective 4: Entrepreneurship Capacity Building.

- a) Assist farmers to develop crop budgets for selected vegetables.
- b) Train farmers in proper invoicing.
- c) Train farmers in negotiating skills to bargain with buyers.
- d) Train capable farmers to be seed and input dealers.

Objective 5: Market linkages and trade promotion. Market Participation.

- a) Establish production capacity and potential yields expected from the farmers.
- b) Estimate average percentage of yields to be consumed by farmers.
- c) Estimate volumes left for the market to implement appropriate marketing strategies. Group Market Linkages.
- d) Identify lodges, hotels and supermarkets in the participating communities to find out their supply sources of vegetables.
- e) Leverage ASNAPP existing market channels as a penetrating point for vegetable produce from the project.

Objective 6: Groups identify new markets and build commercial capacity.

- a) Build capacity of lead farmers to aggregate commercial volumes.
- b) Communicate market information and requirements to farmer groups.

Summarized Approach to Creating Impact:

The goal of this project is to increase food security and generate income for rural farmers through quality production of vegetables and oyster mushrooms. This project enables these communities to have access to appropriate germplasm and involve them in the production and commercialization of high value produce to diversify their incomes. This project impacts 675 farmers (55% women) from the communities in the Linda, Nsongwe, Maramba, Mapenzi and Livingstone regions to produce 165 metric tons of vegetables valued of \$240,000. This project uses our a market-first science based approach involving private sector buyers including the Zambesi Sun, Royal Sun, Spar and Shoprite supermarkets, David Livingstone Hotel, Chrismar Hotel and lodges in Livingstone with whom we partner. We focus on the production of high value horticulture crops some of them including cabbage, carrots, egg plant, baby marrow, butternuts, green beans, sweet melon, water melon, bulb onion, pumpkin, big tomato, sweet pepper/green and sweet pepper -red and yellow. For 2008, each of these crops has generated income ranging from \$15,000 for Sweet pepper-red & yellow to \$87,000 for sweet melon (Petrus Langenhoven et al., 2008).

Impact:

Objective # 1: Build local scientific and technical capacity

- Practical working modalities have been established at a strategic location to build the technical capacity of farmers
- 135 farmers have (men (55) and women (80) have been trained in nursery management under the greenhouse environment. These structures will provide year round availability of planting materials for the farmers which for now is a major obstacle.

Objective # 2: Apply research findings and technical knowhow

- Training on Quality Control of vegetables has been done for some group of farmers
- 100 farmers who are already involved in vegetable production have been trained on how to adhere to quality and hygienic parameters which affect food safety.

Objective # 3: Facilitate the development of policies that improve local horticulture trade and export capacity

- Stakeholders have been asked to meet periodically with farmers to exchange information and update farmers of current market trends.
- The major market partners (locally and regionally) have scheduled to meet farmers in the program on 20th September 2010. Report on the outcome will be available in the 3rd quarter report.

*V. Indigenous African leafy vegetables for enhancing livelihood security of smallholder farmers in Kenya*

Implementing Team:

Stephen C. Weller, Maria I. Marshall, Purdue University; Dr. Dharma Pitchay, Tennessee State University; Dr. Mathieu Ngouajio, Michigan State University; Dr. Pamela Obura, USAID/AMPATH Project; Dr. Grace Cheserek, Moi University; Dr. Elizabeth Omami, Moi University; Dr. Julius Ochuodho, Moi University; Christine Ndinya: Kenya Agricultural Research Institute (KARI); Dr. Chris Ojiewo: AVRDC;

Report Submitted By: Stephen C. Weller

Crops: African Leafy Vegetables (ALVs) - spider plant (*Cleome gynandra*), African nightshades (*Solanum scabrum/S. villosum/S. americanum/S. tanderomotum*) and amaranths (*Amaranthus blitum/A. dubius/A. hybridus /A. spinosus*)

Countries: Kenya and Tanzania

Project Objectives:

1. Assess and enhance genetic resources of ALVs for Kenya
2. Improve ALV seed system availability to Kenyan stakeholders
3. Develop and disseminate improved horticultural practices and postharvest technologies for ALVs
4. Develop marketing strategies for ALVs
5. Promote educational programs on ALV's for farmers and other community groups

Problems Addressed:

1. Poor ALV seed system
2. Poor market channels and lack of market information
3. Poor horticultural practices and technologies adapted to smallholder production systems

Major Activities and Key Outputs:

1. Two variety trials established and maintained at regional research centers (Kenya Agricultural Research Institute -KARI Kakamega and Moi University research fields) to evaluate and select 33 elite germplasm for adaptation to various agro ecological environments covered by the project.
2. Baseline and Market survey tool developed to gather producer and market information. The baseline survey tool developed has been reviewed and approved by participation institution's review boards (Purdue and Moi Universities). This survey will be completed in September, 2010.
3. Sub-awards prepared and signed by participating institutions.
4. Five members of the project team (Steve Weller, Mathieu Ngouajio, Dharma Pitchay, Pamela Obura and Christine Ndinya) participated in the inception workshop held in Singapore, organized by the Hort CRPS secretariat.
5. Continued identification of target farmers to participate in farmer's training, participatory variety evaluation and on-farm demonstrations. A total of 280 farmers in which 14 are individual farmers, and the rest are members of 14 farmer groups (comprising mainly of women) have been identified in five sites in western Kenya. Training on good basic agronomic practices (soil management, soil preparation, fertilization, planting techniques,

crop management), business management considerations, community organization and farmer attitudes assessments were initiated in late July in 3 of these communities.

Summarized Approach to Creating Impact:

In order to effectively communicate our message to as many people as possible, we have intentionally targeted active community groups who meet regularly. The message is given to the community group members with the help of the local extension personnel who already have a rapport with the farmers. These extension personnel include our AMPATH facilitators.

AIV germplasm of African nightshade, Amaranth and spiderplant have been evaluated at 2 test sites and best performing cultivars are now being tested for consistency of performance prior to farmer selection and farmer on-farm testing in the 3rd quarter of 2010.

PROJECT SUMMARIES BY PRIORITY ISSUE  
Postharvest Technology

*I. Concentrated solar drying of mango and tomato*

Implementing Team: Diane Barrett,  
Pieter Stroeve, Jim Thompson,  
Bertha Mjawa

Report Submitted By: Pieter Stroeve

Crops: Tomatoes and Mangoes

Country: Tanzania

Project Summary:

After design of the first prototype of the concentrated solar drier, the drier was tested outside on the UC Davis campus using a test material as a model material. The wet test material was cubes of wet sponges. Depending



The concentrated solar dryer works in cloudy climates.

on weather conditions the wet sponge cubes dried in two to five hours in the concentrated solar drier. Using borrowed temperature probes and a hot-wire anemometer, temperatures and flow rates were measured inside the drier. Based on these results, we have proceeded to design an improved (second proto-type) drier and order specified temperature probes for both dry and wet bulb temperatures measurements, two more sensitive hot-wire anemometers and one data logger. The improvements of the second prototype drier (compared to proto-type one) are: 1) better air flow control in the drier, 2) more transparent and robust plastic windows on the outside of the drier and 3) improved instrumentation for measurements.

Major Activities and Key Outputs

Improvement of the design of the concentrated solar drier and construction of the second prototype is finished. An additional prototype two drier is being constructed. Measurement equipment has been evaluated and improved probes and a data logger have been ordered and will be installed on the two newly constructed driers.

Summarized Approach to Creating Impact:

A poster was presented on the concentrated solar drier at the UC Davis Energy week, supported by the California Solar Energy Collaborative (CSEC) in May 2010. This poster is available on the CSEC website: <http://solar.ucdavis.edu>

Our collaborator Bertha J. Mjawa, Ministry of Agriculture Food Security & Cooperatives, United Republic of Tanzania has been continually informed on the progress of the drier design and performance.

We have further increased our interaction with the D-Lab in the Energy Efficiency Center at UC Davis and made contacts with Susan Kinne, Director, Programa Fuentes Alternas Universidad

Nacional de Ingenieria Managua, Nicaragua. Susan Kinne will visit our team in Davis in early November and some of our team members are planning to go to Nicaragua in early December to test the proto-type two drier on the drying of mangoes.

Work is progressing as scheduled. After drying test materials, we will dry tomatoes in October.

*II. Biological-based postharvest quality maintenance and disease control for mango and papaya*

Implementing Team: Robert E. Paull, Nancy Jung Chen, Shanthi Wilson Wijeratnam, Chamila Wijesinghe, Shiranthi Perera, Chamari Wickramathilaka

Report Submitted By: Robert E. Paull

Crops: Mango and Papaya

Country: Sri Lanka

Project Objectives:

1. Determine the effectiveness of different coating and essential oils in controlling postharvest disease of mangoes and papaya and maintaining fruit quality.
2. Isolate and evaluate epiphytic microbial antagonists in vitro against papaya postharvest pathogens.
3. Evaluation of an integrated postharvest disease protocol from harvest through storage using coatings, essential oils and selected microorganism in simulated shipping.
4. Transfer the findings of this research via a minimum of two sets of training of trainers' workshops and stakeholder workshop.

Problems Addressed:

Postharvest losses of papaya and mangoes grown by small farmers and marketed in local and national markets in less-developed countries ranges up to 60%. Papaya fruit postharvest losses of up to 75% have been reported to Hawaii shippers. Observations with supermarket personnel and store produce managers suggested that losses range widely from 10 to 50%. These postharvest losses occur in every wet and wet/dry tropical region of the world. All engaged in the production, collection and distribution of fruit and vegetables do not have access to necessary postharvest handling information and resources to obtain optimum returns and reduce losses. They often resort to practices that are not only ineffective but may also pose a health hazard.

This project brings together two parallel research programs being done in Sri Lanka using natural coating and essential oils with the efforts in Hawaii to use natural epiphytic microorganisms to control tropical postharvest diseases. Essential oils are complex volatile compounds produced in various higher plant parts such as leaves, flowers, bark and roots. Volatile compounds from plants can inhibit the growth of fungal pathogens and evaporate without leaving residues and are considered benign from a health perspective. Epiphytic microorganisms isolated from papaya fruit will be evaluated for their ability to control postharvest disease by their actions as antagonistic microorganisms to pathogens. This Hawaii research follows from our successful isolation of a yeast strain for pineapple postharvest disease control.

Major Activities and Key Outputs:

Objective 1. Determine the effectiveness of different coating and essential oils in controlling postharvest disease of mangoes and papaya and maintaining fruit quality.

In-vitro screening of six herbal extracts has been completed. Three extracts have been selected for further studies.

Objective 2. Isolation and selection epiphytic organisms that suppresses disease development  
Seventy epiphytic yeast strains and two bacteria have been isolated from papaya fruit. The strains have been assayed as to their antagonistic action against *Anthracnose* applied the same day or two to three days after the pathogen. Three yeast strains isolates show considerable activity and can suppress Anthracnose development up to 80%. These strains were hand carried to Sri Lanka in August for addition to the wax formulations with and without essential oils. We are now evaluating the isolates as to their effectiveness against stem end rot causing organisms.

Objective 3. Evaluation of an integrated postharvest disease protocol from harvest through storage using coatings, essential oils and selected microorganism in simulated shipping.  
Coatings with suitable characteristics for use with fruit have been identified. The selected herbal extracts have been observed to be compatible with the ITI wax formulation.

Objective 4. Transfer the findings of this research via a minimum of two sets of training of trainers' workshops and stakeholder workshop.  
See impact section below.

Summarized Approach to Creating Impact:

A postharvest workshop for mango collection agents was held to introduce loss minimization procedures during handling transportation of mangoes. Participants were introduced to the current HortCRSP Project and their subsequent support for dissemination of technology. Forty-five participants attended this program.

Two members of the Sri Lankan team participated in the 2010, fortnight postharvest short course conducted by the University of California Davis from 14th – 25th June 2010. Besides updating their knowledge on current postharvest treatments and procedures, and the experience of visiting large scale postharvest operations as practiced in developed countries, they also brought back valuable training materials. These will be used in our training of trainers (Vidhatha Officers) postharvest awareness and technology transfer program.

The Team Leaders attended the inception workshop held in Singapore from 16th -18<sup>th</sup> May, where they presented posters titled “Postharvest research at the Industrial Technology Institute” and “Microbial Biocontrol of Postharvest Papaya Diseases”. The workshop was a very informative experience, and provided the opportunity to find out more about the HortCRSP program. The presentation of case studies/success stories were of particular interest. The workshop also proved valuable in establishing new contacts with scientists from the internationally to discuss areas of mutual research interest and find out about resources and opportunities available for capacity building in our respective institutions. It was also a wonderful opportunity to renew contact with existing contacts.

Impact:

The proposal aims are to develop and evaluate biological-based, nontoxic, environmentally suitable approach for postharvest disease control. The output from this project provides an alternative postharvest disease control approach to fungicide in conventional and organic mango and papaya production. The technology developed in this research would be introduced to extension officers via workshops to be held at the Vidhatha collection and distribution centers in Sri Lanka.



- We have evaluated essential tropical oils as disease control agents for mango and papaya.
- Determined whether the incorporation of essential oils into natural coatings maintains fruit quality and reduces postharvest diseases.
- Selected epiphytic microorganisms that reduce papaya and mango postharvest disease.
- Begun the integration of the technology into the postharvest handling protocol for mangoes and papaya grown by small farmers in Sri Lanka.
- Begun the transfer of the technology developed in this project to the collection and distribution centers with the assistance of the Vidhatha Centers for the mutual benefit of all stakeholders.
- Researchers in Sri Lanka have make contact with women growers and other stake-holders in the supply chain associated with mango and papaya during their bi-monthly visits to fruit production and collection sites
- Improved the Sri Lankan ITI postharvest laboratory to allow it to expand its scope of activity and improve its research capabilities via the collaboration.

### *III. Coolrooms and cool transport for small-scale farmers*

Implementing Team: Michael Reid, James Thompson, Gloria Androa, Neeru Dubey, and Cecilia Chi-Ham

Report Submitted By: Michael Reid

Crops: All crops

Countries: India, Honduras, and Uganda

Project Objectives:

- Test a range of indigenous and novel materials as possible insulation materials for cool stores and cool transport
- Test the effectiveness of the Cool-bot™ thermostat/room air conditioner system for refrigerating mall-scale coolroom
- Evaluate the possibility of using photovoltaic panels to power the Cool-bot™ and room air conditioner under developing-world conditions

Problems Addressed:

Refrigerated storage and transportation is largely absent from the perishables value chain in these countries. The refrigeration systems that are normally used in developed countries are not only too expensive for purchase by limited resource farmers or farming communities, but also are difficult to source and maintain. The three problems addressed in this proposal are the cost of conventional insulated installation, the cost of conventional cool room refrigeration, and the cost, limited availability and unreliability of electricity supplies in the developing world.



Collaborators learn how to use the Cool-bot™.

Major Activities and Key Outputs:

- During the first half of the project year, the investigating teams primary focus was on training and development of information related to the installation and operation of coolrooms.
- Reid and Thompson installed and tested an air-conditioner/Cool-bot™ controller module that was purchased by the previous project funded by the Gates foundation. It was installed in an abandoned cooler on the student farm. After 'tweaking' the Cool-bot™ controller, it did a good job of maintaining temperatures in the cooler.
- Three members of the collaborating teams - Julia Gomez, Gloria Androa, and Neeru Dubey travelled to Davis, and participated in the UC Davis postharvest short course and field trip, gaining in-depth information on optimal postharvest handling and postharvest technology.

- Following the Short Course, the collaborators spent a week with Reid and Thompson in a workshop designed to provide the tools and information that needed to execute the planned project in country. Workshop activities included:
  - Construction and use of thermocouples with the thermocouple dataloggers and netbook computers provided by the project.
  - Operation of the 'Cool-bot™' refrigeration controller
  - Determination of insulation effectiveness of potential in-country insulation materials
    - (straw, feathers, shredded paper, polystyrene)
  - Use of straw bales in constructing a simple coolroom with high insulation value
  - In preparation for the workshop, the solar panels and control systems for a demonstration unit in Davis were ordered, but did not arrive in time for all the collaborators to participate in assembly and testing. However, Androa and Reid spent two days constructing simple racks for the solar panels, and consulted with a local sustainable energy engineer on the assembly of the charge controller/inverter modules.

In-Country Activities:

Honduras: Collaborators Chi-Ham and Gomez have been working with a women's cooperative that produces tropical flowers, with the intent of developing an export market in the U.S. The coolroom proposal overlaps with their project, and the team has identified a room at the packing station site that will be insulated and fitted with the air-conditioner/Cool-bot™ system.

Uganda: Collaborator Androa has identified a site for the coolroom installation in a local village. Exploration of potential indigenous insulation materials has identified papyrus, already widely available and used in domestic construction, as a very viable possibility. A solar technician has been identified to assist with assembly of the solar power system.

India: Collaborator Dubey has developed plans for a coolroom that is now under construction, using a sandwich construction with rice hulls as the insulating 'meat' in the mud-brick sandwich.

Summarized Approach to Creating Impact:

At this stage of the project, the training of collaborators at Davis has been the primary approach to creating impact.

Impact:

Trained collaborators, supplied with a wealth of information on postharvest biology and technology.

PROJECT SUMMARIES BY PRIORITY ISSUE  
Nutrition

*I. Concentrated nutritional and economic enhancement of Ghanaian traditional diets, using orange-fleshed sweetpotato products*

Implementing Team: Eunice Bonsi, Conrad Bonsi, Prosper Doamekpor, Wisdom Plahar, Robert Zabawa, Fafali Azaglo, Joseph Apedo and Esi Apedo.

Report Submitted By: Dr. Eunice Bonsi

Crops: Orange-Fleshed Sweetpotato (OFS)

Country: Ghana

Project Objectives:

1. Build the technical capacity of OFS farmers, processors and bakers in good postharvest handling practices in the agricultural value chain.
2. Develop and package OFS puree.
3. Utilized OFS puree for local bread production.
4. Analyze/pilot test other potential OFS products such as weaning foods for health.
5. Analyze economic activities of OFS from production to consumption.

Problems Addressed:

1. Lack of availability of OFS
2. Lack of knowledge of market potential of OFS
3. Lack of production efficiency to produce the quantity and quality of OFS to get a given price at market to receive a reasonable rate of return (profit)
4. Inconsistent weight of bagged OFS
5. Inconsistent quality of OFS
6. Lack of processed OFS into flour

Major Activities and Key Outputs:

1. Increased production of OFS by farmers
2. Training on the market potential of value-added OFS
3. Training on OFS production on ridges as opposed to traditional mounds
4. Provided scale to weigh bagged OFS
5. Provided training on grading OFS to increase quality
6. Provided trial runs of OFS into flour

Summarized Approach to Creating Impact:

1. Increase in quantity + increase in quality → multiple quality value-added products
2. Increased in value-added products → increased: income, consumption, health, quality of life



Farmers evaluate sweetpotato varieties.

Impact:

Increased production and use of sweetpotato has moved beyond research through on-farm partnerships and processing application into flour in real women small business situation. A formulated product using OFS flour has been analyzed and identified to be released to processors for mass production and marketing.

## PROJECT SUMMARIES BY PRIORITY ISSUE

## Food Safety

*I. Enhancing trade in horticultural crops through food safety and phytosanitary measures*

Implementing Team: Sally A. Miller, Jeffrey T. LeJeune, J. Mark Erbaugh, The Ohio State University; Kenneth Shenge, Ahmadu Bello University, Zaria, Nigeria

Report Submitted By: Sally A. Miller

Crop: Tomato

Country: Nigeria

Project Objectives:

1. Identify knowledge, perceptions and practices of market vendors and farmers regarding food safety, plant disease and marketing constraints that affect production and trade.
2. Identify plant health issues limiting tomato productivity and potential for trade on smallholder farms, and sources and magnitude of tomato microbial contamination on farms and in markets in Nigeria.
3. Based on the results of the project components with the objectives listed above, develop a GAPs program suited for smallholder Nigerian farmers.

Problems Addressed:

1. Lack of documentation of crop protection and food safety knowledge and practices amongst northern Nigerian tomato farmers
2. Lack of training of Ahmadu Bello University (ABU) staff and students in sampling techniques and microbiological methods for plant disease and food safety assessments.
3. Requirements for Institutional Review Board (IRB) approval of survey for proposed surveys by The Ohio State University; lack of facility within ABU to meet OSU IRB requirements. These requirements delayed project implementation.

Major Activities and key outputs

1. OSU team (Miller, LeJeune, Erbaugh) traveled to Nigeria June 10-17 to work with ABU counterparts. The household survey was revised within the group, pre-tested in Ikara, Kaduna State separately with two male (male enumerator) and two female (female enumerator) farmers. ABU social scientists Raphael Omolekin and Ladi Yakuba supervised the pre-testing for male and female farmers, respectively. Miller and Erbaugh also observed the pre-testing. The household survey was again revised after the pre-test and is ready for implementation.
2. LeJeune and ABU counterpart Clement Whong trained ABU staff on methods for on-farm produce sampling and laboratory microbiological assessment. Shenge and Miller trained ABU staff on plant pathogen identification.
3. Completed all of the requirements for IRB approval. OSU IRB evaluated the proposal, decided that it was non-exempt, and conducted an outside review with a consultant familiar with Nigeria. OSU agreed to serve as the IRB of record since ABU does not have an IRB. ABU applied for and received a US Federal Wide Assurance (FWA), after which OSU signed an agreement with ABU and approved the survey.

Summarized Approach to Creating Impact:

This project uses knowledge generated from rapid market appraisals and household socioeconomic surveys, supported by microbial assays to design a tomato GAPs document. Training is also offered to extension workers and other stakeholders in the region to raise their capacity to produce tomatoes in accordance with phytosanitary standards. This enhances domestic and regional trade, and increases income to local producers.

This project contributes directly to building local capacity to provide science-based information for the development of process controls, standards and policies necessary to increase trade and exports to countries outside the region by partnering with The Nigerian Agricultural Extension and Research Liaison Services (NAERLS), which is directly responsible for making agricultural and rural development policy recommendations to the Nigerian Ministry of Agriculture.

## PROJECT SUMMARIES BY PRIORITY ISSUE

## Enabling Environment

*I. Building an ornamental plant industry in Honduras*

Implementing Team: Alan Bennett, Cecilia Chi-Ham, Julia Gomez, Mike Dobres, David Fleming, Julio Rendon, and Dinie Espinal de Rueda.

Report Submitted By: Alan Bennett and Cecilia Chi-Ham

Crop: ornamentals/tropical flowers

Country: Honduras

Project Objectives:

1. Build local scientific and technical capacity
2. Apply research findings and technical knowledge to increase small producers' participation in markets
3. Facilitate the development of policies that improve local horticultural trade and export capacity.



Ornamental crops provide extra income for farmers.

Problems Addressed:

- Logistical issues to export flowers from Honduras
- Cold Room Storage to improve cold storage in the farm
- Post Harvest assistance and training of Honduran Staff in the US.
- Phytosanitary Training of Honduran staff to be able to perform pest diagnosis

Major Activities and Key Outputs:

- I. Training of three Honduran Collaborators.
  - i) Post Harvest Course, June 2010, UC Davis, Davis, CA Julia Gomez (female) attended a 2 week intensive course in the US.
  - ii) Training” Deployment of rapid diagnostic tools for Phytophthora on agricultural crops in Central America ", Costa Rica (Estela Aguila, female) attended Horticulture CRSP Course; June 28-July 2nd, in Costa Rica (PI of Horticulture CRSP Grant, Jean Ristaino and Monica Blanco).
  - iii) Breeding and Plant Propagation, (Ricardo Sanchez, male) 6 month training in NovaFlora USA July 2010.
- II. Addressing Cold Storage issues in the farm-market chain.
- III. Preparation for first test shipment.
- IV. Preparation of Workshop in Honduras in Aug 2010.

Summarized Approach to Creating Impact:

Developing a strategy to test export flowers in Honduras and identify distributors in the US that are willing to test the product and moving forward on a strategy to test a new export market.



*II. Improving market access for emerging South African Rooibos farmers*

Implementing Team: Laura T. Raynolds, Andries du Toit, Douglas L. Murray, Jennifer A. Keahey, Sandra Kruger, and Lisa Ryser.

Report Submitted By: Laura T. Raynolds

Crop: Rooibos

Country: South Africa

Project Objective:

1. Identify emerging Rooibos farmer market capabilities, opportunities, and constraints.
2. Develop institutional capacity of South African Rooibos Council to provide an enabling environment for emerging farmers through the implementation of training and support services.
3. Implement participatory training services to improve market-access prospects for emerging farmers.
4. Evaluate project outcomes to analyze existing emerging farmer policies and inform ongoing policy development and reform at both the national and international levels.

Problems Addressed:

(1) Global value chain, actor-network, and survey research. We have mapped the rooibos value chain, merging and expanding ongoing research from the market side by CFAT and from the producer side by PLAAS and SKA. We have identified key actors, market characteristics, and opportunities for upgrading via processing/packaging, certification, geographic indicator branding, and new high-value product areas. We have used an actor-network analysis to better understand the institutions and policies affecting rooibos producers and emerging farmers and to identify and secure the participation of key stakeholders. We have found that the rooibos market and local institutional engagement is very changeable and have adjusted the project to account for these changes. For example, a processing/packaging company we planned to work with is being reorganized so we have identified other project partners. In addition there is a new certification (UTZ) entering the South Africa rooibos sector which we have integrated into our project.

We have assembled representative emerging farmers from key rooibos regions and major organizational partners to work with us in devising locally relevant indicators that effectively measure producer capabilities and constraints, with particular focus on gender, race, and ethnicity concerns. These indicators have been used to develop our survey. We have established our methodological protocol for sampling to ensure proportional representation by farm size, socioeconomic status, gender, race, and ethnicity in our survey design and implementation.

(2) Institutional Capacity Building. We are developing the institutional capacity of the South African Rooibos Council to support the 5,000 people who depend on rooibos for their livelihoods. We are building on the existing institutional framework to provide emerging and female farmers with sustainable training and support mechanisms and extend their capacity by forming the Emerging Farmer Working Group and related Women's Networking Group. We are promoting an enabling environment for small farmers and forum for collective action. Working with these stakeholders we are developing organizational protocols and training mechanisms. Gender equity and women's concerns are central in all capacity building areas. In regards to developing local institutional capacity we have had to replace one women's agricultural group which is being

reorganized with another institutional partner. Preliminary findings demonstrate that female involvement is variable across communities. We seek to stimulate female engagement in weak areas via enlistment of identified female leaders in strong areas and through the delivery of female-focused training. The strong participation of females on the project team has facilitated female producer engagement. Moreover, identified female leaders have been very active in assisting with the project and are interested in forming a Women's Networking Group.

(3) Participatory Training Development and Delivery. We have held 7 preliminary training workshops with emerging farmers in each of the project communities. Fourteen farmer leaders (7 male/7 female) were elected during these workshops to facilitate further project development and delivery. We have conducted the first 3-day TOT workshop with the 14 identified farmer leaders and 1 female processing representative covering participatory training methods and informational content. Using a participatory approach we have identified and prioritized training needs. The TOT-trained extension workers are expected to each train 50 participants in two workshops. Upholding local gender norms, female trainers will be responsible for training women producers and family enterprise workers and enhancing training to meet specific gender needs. We have found that emerging Rooibos farmers lack effective communication networks which has significantly hampered market-access prospects. To address this concern, we prioritized communication improvement in our first training-of-trainers (TOT) session with identified farmer leaders. By working directly with producer communities via farmer leaders, we have noted preliminary signs of communication improvement, and will continue to monitor ongoing developments as we expand project engagement. In addition, we are integrating farmer leaders into monitoring and evaluation activities via training in community needs assessment and active participation in data collection processes. This will enable farmer leaders to effectively gather and analyze producer information so that they may communicate needs to industry and organizational representatives. Via TOT, we are providing farmer leaders with the skills to collect and disseminate industry information to their communities as they will facilitate community training sessions with our support in subsequent project phases. We have struggled to meet expected numbers in terms of overall farmer involvement. In our initial needs assessment, farmers highlighted their reluctance to participate in this project as they have previously been subject to a number of rapidly implemented projects that they feel have been non-participatory and ultimately unsuccessful in terms of transferring skills and opening opportunity for broader engagement. As such, we have sought to ensure full participation throughout this project by integrating expressed farmer needs into our activities and outputs, and via farmer leadership identification and training. Thus, we expect overall numbers to increase in the next phase of community training as farmer leaders from within each community grouping will seek to expand involvement as they develop and lead training sessions with our assistance.

#### Major Activities and Key Outputs:

In the first quarter, we conducted 5 of 7 preliminary training workshops to which we invited all emerging farmers within each of the identified community groupings. In the second quarter, we conducted the remaining 2 workshops. As we held farmer leader elections during these workshops, we now have identified 14 farmer leaders (7 male/ 7 female). We have also identified a female representative from a local processing plant to join this group via TOT training and Rooibos Council Emerging Farmer Working Group membership. Thus we have now established the Working group and membership is comprised of 7 males and 7 females.

We have conducted the first 3-day TOT workshop with the 14 identified farmer leaders and 1 female processing representative. We used farmer ranking of HortCRSP performance indicators from initial community workshops to prioritize training needs and we incorporated new

components as farmers identified additional pressing needs. This initial TOT focused on the foundational components of our broader training topics which will be covered in further depth in the subsequent TOT.

We have provided preliminary market-access and food safety training via the preliminary TOT and we engaged in a series of activities to introduce farmer leaders to numerous industry and organizational experts. These activities included a tour of Rooibos Ltd. processing facility, a tour of its quality control division, and attendance at an UTZ workshop to introduce farmers to Solidaridad representatives who are introducing the UTZ market standard to the Rooibos industry. Farmer leader attendance at this workshop has allowed us to determine the potential to link farmer leaders to UTZ certification assistance. We have also developed ongoing reports to project participants in Afrikaans, which we disseminate upon the conclusion of each training session. Finally, we are continuing to work with the Rooibos Council to reformulate their Black Economic Empowerment program and to further institutionalize the Emerging Farmer Working Group.

In terms of outputs, we have also developed farmer learning guides, including training materials for the first round of workshops and TOT training materials. We have developed a series of capabilities indicators to develop baseline indicators for monitoring and evaluation purposes. These indicators have been integrated into learning workbook exercises for workshops and TOTs to assess and document skills and knowledge attainment. Additionally, we have integrated indicators into farmer interview methodology and instruments which we will conduct as part of our ongoing monitoring and evaluation process. Farmer leaders are drafting protocols for Working Group roles and responsibilities and with our assistance, will draft survey research instruments for final project evaluation. Finally, we are drafting a working paper on our participatory learning approach to social and economic assessment within emerging farmer communities.

#### Summarized Approach to Creating Impact:

We are seeking to move message beyond research in multiple ways. As farmers have stated that previous projects in their areas have led to inadequate skills transfer and an overall sense of disempowerment, we have chosen to implement this project by focusing on empowerment both in terms of process and outcome. Indeed, findings from our initial needs assessment highlight the importance of process if sustainability is to be achieved. Thus, we have expanded our TOT approach to provide the in-depth skills and knowledge transfer that farmers require so that identified leaders may effectively disseminate information between emerging farmer communities and the broader industry. Further, we are working with industry and organizational representatives to provide a more enabling environment in which emerging farmers may participate. We are accomplishing this via formation of a Rooibos Council Emerging Farmer Working Group, and by linking identified farmer leaders with relevant industry, organizational, and academic actors. Finally, we are fully integrating farmer leaders into research components via community needs assessment training and active participation in project monitoring and evaluation processes. This will enable leaders to network with academic actors and participate in regional-level academic seminars so they may participate more fully in research initiatives that they identify as relevant. In brief, our overall approach seeks to ensure that communities will be able to take charge of market-access potential by proactively analyzing and engaging in identified opportunities, rather than remaining dependent upon outsiders to determine assistance.

**Impact:**

Despite variability in female involvement across participating communities, we have succeeded in ensuring overall gender equity throughout the project. We have accomplished this by stimulating female engagement in weak community groupings via enlistment of identified female leaders in strong groupings and via female-focused training delivery. In terms of TOT delivery, identified farmer leaders initially reported that they were reluctant to participate as they felt they would not be able to learn the material, and/or that our promise of full inclusion would prove empty. In TOT evaluations, leaders expressed high levels of satisfaction with training materials and appreciation for the participatory nature of training delivery. Moreover, we have been working with farmer leaders to develop the final set of training material and associated farmer's guide to certification as their involvement in the production of these materials will enable them to more effectively deliver community-based training in the next project phase. Farmer leaders have also become active in assisting with ongoing research components and 7 farmer leaders (4 male, 3 female) have formally applied to work as translators during farmer interviews. Farmer leaders have also begun to develop networks with the following industry and organizational actors: South African Rooibos Council, Rooibos Ltd. (processor), Solidaridad, Fair Trade South Africa, and the Southern African Fair Trade Network. Finally, we are in the process of assisting them with developing formal protocols for Working Group roles and responsibilities.

### *III. Promoting fruit and vegetable production to improve nutrition in Nkokonjeru, Uganda*

**Implementing Team:** Kate Scow (University of California, Davis), the Rural Agency for Sustainable Development (RASD), the Mukono Zonal Agricultural Research and Development Institute (MUZARDI), Uganda Christian University (UCU), Nkokonjeru Parish Demonstration Farm and Nursery

**Report Submitted By:** Sean Kearney

**Crops:** fruits and vegetables

**Country:** Uganda

**Project Objectives:**

1. Increase vegetable and fruit tree production through farmer field schools and strengthen farmers' access to local and regional markets for vegetables and fruits
2. Strengthen local farmer group structure and capacity of RASD and Nkokonjeru Parish to support farmer groups.
3. Increase involvement of women in agricultural activities (research, education, outreach) in Nkokonjeru township and Mukono
4. Enhance institutional capacity in agriculture at Uganda Christian University (UCU) and promote research and education exchange among UC Davis, UCU and other collaborating institutions



Farmer groups are often the key to successful projects.

**Problems Addressed:**

Most residents of the Nkokonjeru region of Uganda are small-holder farmers yet very few grow many vegetables. Vegetable production is important both for the improved nutrition of rural households and as a potential income source. Fruit production for home consumption is more common but very few small-holders in the area sell their fruits despite many local institutional markets (such as schools and hospitals) and the nearby urban centers of Mukono and Kampala. Some of the primary problems farmers have with growing more fruits and vegetables that this project is addressing are as follows:

- **Lack of access to training and extension:** The majority of extension activities conducted in the area have been related to staple crops (i.e. matooke bananas), traditional cash crops (i.e. coffee) and livestock. Many of the farmers participating in our project have not received training for fruits and vegetables and do not have consistent access to trained extension agents. Fruits and vegetables have unique issues surrounding pests and diseases, soil fertility, crop management and marketing that cannot be easily adapted from the traditional training they have been receiving. The discovery-based approach of the farmer field school trains farmers to be able to identify and discover solutions to agricultural problems.
- **Limited land, capital and bargaining power and high risk:** Due to population pressure, many farmers do not have enough land to produce sufficient quantities of fruits or vegetables to participate in markets for these crops. Additionally, few farmers have the resources or access to capital to grow high value/high input crops or to bear the higher risk associated with these

- crops. Our project works to help develop and strengthen farmer groups so they can pool resources and knowledge to share risk, improve bargaining power and access information.
- **Lack of access to technology and information:** Our project targets rural farmers with very limited access to agricultural technologies and related information. Participating farmers rarely use purchased inputs such as improved seed varieties, chemical fertilizers, pesticides and even basic tools such as spray pumps and wheelbarrows. Even when farmers do get access to these technologies they often lack basic yet important information such as which varieties are resistant to disease, how to apply chemical fertilizers or proper mixing ratios for pesticides.
  - **Limited availability and access to fruit tree seedlings:** Most farmers in the area grow fruit trees from collected seed with little knowledge of or access to improved varieties. The nearest source of improved seedlings is the town of Mukono. Most farmers do not know what is available at the nurseries in Mukono and even those that do tend to lack the resources to successfully transport seedlings to their farms.
  - **Low involvement of women in agricultural extension and agricultural income generating activities:** Transactions dealing with cash crops and livestock are often dominated by men and men tend to control resources and hold leadership positions within farmer groups or associations. Additionally men have historically dominated agricultural research and extension positions in the area.

### Major Activities and Key Outputs

#### Farmer Field Schools:

We are currently over halfway through conducting farmer field schools (FFS) with 14 farmer groups around Nkokonjeru. After conducting a needs assessment and developing a curriculum with eight participating facilitators, the FFS commenced in early May with sessions on group formation and governance. Each group elected at least three members to executive leadership positions and developed a constitution to help govern their group and created a workplan to guide their FFS throughout the growing season. Each group also received introductory training in savings and financial management as they prepared their workplans and was given savings booklets to keep track of their individual financial contributions to the group.

Once groups were formed and formalized they began planting tomatoes on a minimum 20x20m study plot. As per their workplans, each group developed one or more experimental trials to learn about and test various management practices. Trials included: variety trials (mostly to test tolerance to bacterial wilt); organic vs. inorganic soil amendments; organic vs. inorganic pest management; staking vs. mulching and; direct seeding vs. transplanting from a nursery bed. We estimate that as much as twice the amount of tomatoes that are in the study plots have been planted including the small plots individuals have chosen to plant at their respective homes with seed leftover from the study plots (we hope to have more exact numbers as a result of our survey in the 3rd quarter).

Each group was allocated a budget of about \$125 and chose, with the guidance of their facilitators, which inputs they would like to be provided. Through this approach we have distributed improved seeds, fertilizers, manure, pesticides, spray pumps, pesticide safety equipment, tools, wheelbarrows, watering cans and drums for water storage. The inputs and tools received by each group depending on their needs and their on-farm trials.

Many group members we have talked with had not previously had access to many of the inputs provided, especially improved seed varieties and inorganic fertilizers. Additionally many participants have mentioned learning new management techniques such as sowing a nursery and

transplanting, using supplemental irrigation to grow vegetables in the dry season or composting manure. So far each farmer group has been provided with a chart which helps them identify common pests and diseases in tomatoes and provides the recommended control measures.

#### Soil Research:

During the 2nd quarter we finalized the procedure for on-farm soil fertility trials to evaluate effective combinations of micro-doses of chemical fertilizers with manure. We implemented a practice plot at the Parish Demonstration Farm to test our experimental procedure and work out any kinks. At the end of the 2nd quarter the practice plot was underway and we had identified eight plots on farms within our FFS farmer groups. The on-farm experiments are currently underway at the time of this report.

#### UCU Internships:

Two female students from Uganda Christian University (UCU) in Mukono participated in a variety of hands-on learning activities throughout the 2nd quarter as part of an internship program funded by the project. Funds covered the students' tuition as well as transportation and other costs related to the internship. Both students shadowed facilitators and attended FFS sessions 2-3 times per week to learn about participatory agricultural extension and gain knowledge in agronomic production of vegetables.

The students also received hands-on training in fruit tree grafting techniques from experts at the Kawanda National Agricultural Research Centre, the Mukono Zonal Agricultural Research and Development Institute (MUZARDI) and from the nursery manager at the Parish Demonstration Farm in Nkokonjeru. We worked with the nursery manager and both students to set up the soil fertility experiment practice plot at the Parish Demonstration Plot. This provided an introduction to experimental design and soil sample collection techniques as well. The students took on individual research assignments (one on fruit tree grafting and one on organic pest management) and carried out research through the internet and personal conversations with experts. They were able to attend a workshop in Jinja on mechanized agricultural technology in Uganda and visit the Namulonge National Agricultural Research Centre where the majority of horticultural research in Uganda is carried out.

#### Capacity building of the Parish Nursery:

At the beginning of the 2nd quarter a variety of agroforestry trees for use as fodder and soil fertility improvement were planted to be raised as seedlings and sold at the nursery within the Parish Demonstration Farm. Outreach materials for the specific agroforestry trees planted were obtained and are to be distributed along with seedlings as they are sold to ensure the customer is aware of the proper management techniques and uses of the trees. At the end of the 2nd quarter the seedlings were nearing maturity to be sold.

Another project began in the 2nd quarter is the multiplication of a new tomato variety, currently referred to as MT-56, that is supposed to be the variety most marketable and tolerant to bacterial wilt currently identified in Uganda. We had hoped to make this variety available to farmers for on-farm trials in the FFS but it has just recently been developed and is not yet on the market. As such we were only able to obtain a small amount of seed and decided to multiply the seed at the Parish Demonstration Farm.

By the end of next season the Parish Nursery plans to have this seed available for sale to farmers, albeit in limited supply at first. We have begun meetings with the Demonstration Farm staff to develop a business plan for the nursery operations. Land was cleared in June to expand their

existing nursery/shadehouse facilities by 50% to include more fruit tree seedling production for sale to area farmers. Funds transfer issues have delayed the project slightly but construction will begin in the 3rd quarter.

**Internet and website development for RASD:**

After further investigation and multiple discussions with MTN, the leading local internet provider we have identified a potential long-term solution for improved internet access at RASD and for Nkokonjeru as a whole. We solicited an MTN business engineer to come out to RASD to conduct a site survey and it was concluded that the only internet access option currently available to RASD is to use existing cell phone infrastructure for a slow and limited connection. However we did identify that we can present a business case to MTN for construction of a data tower next fiscal year allowing for significantly higher speed and more affordable internet options. We surveyed potential institutional internet customers, collected usage information on twelve institutions and are currently working with MTN to develop a business case for the area.

Project staff at UC Davis has also been working to develop a website for RASD. They have developed a layout for the website, created a PLONE template which can be easily updated by RASD staff and secured a domain name. They are currently working to finish programming and integrate the layout design into the PLONE language. We plan to have an operational website and begin training RASD staff on how to update and maintain the site in the third quarter.

**Summarized Approach to Creating Impact:**

The participatory nature of the Farmer Field School approach focuses on creating sustained impact through discovery-based learning. This means that farmers participating in the project have largely been able to choose the vegetable being studied and the trials being carried out helping to ensure that both are relevant to the farmers. Additionally, the farmers are taught how to observe their crops, identify problems and discover solutions and compare different technologies or management practices. The hope is that farmers will obtain the tools to manage future problems on their own and that this approach can be repeated on other crops in the future. Trained agronomists are involved as facilitators throughout the Farmer Field School to help guide the farmer groups and agricultural/research experts are available for technical backstopping when serious problems occur beyond the facilitators expertise. At the same time, by observing farmer groups and documenting the process, we can conduct basic research on best management practices and appropriate technologies.

Soil fertility research is being carried out through on-farm trials with a high potential for observation and participation by farmers. These trials are taking place on plots owned by participants in the Farmer Field School. Not only do we hope to obtain results that can be used to recommend appropriate fertilizer and manure applications for farmers but farmers can supplement the experiential learning process of the Farmer Field School with observation of a rigorous agricultural experiment.

**Impact:**

To date we have helped to develop and/or strengthen 14 farmer groups. Each of the groups has developed a constitution of by-laws and elected members to leadership roles. Over 300 farmers have attended the Farmer Field School sessions with at least 200 active members receiving training in group dynamics, soil fertility management, pest and disease management, record keeping and agro-ecological systems assessment (AESAs). Each group has planted a 20x20m study plot of tomatoes, which they can sell at the end of the season to generate some income to sustain their group.



Two female undergraduate students of the Ugandan Christian University's Agricultural Science and Entrepreneurship program have completed an agricultural internship. They each received hands-on training in horticultural production techniques, fruit tree grafting, experimental processes and participatory agricultural extension methods.

A water tank was constructed and hooked up to a reliable water source at the Nkokonjeru Parish Demonstration Farm and Nursery. This has allowed the parish to increase their production of fruit tree, coffee and agro-forestry seedlings.

PROJECT SUMMARIES BY PRIORITY ISSUE  
Germplasm

*I. New technology for postharvest drying and storage of horticultural seeds*

Implementing Team: Kent J. Bradford, Peetambar Dahal, Keshavulu Kunusoth, Acharya, Jwala Bajracharya, Bhartendu Mishra, and Johan Van Asbrouck

Report Submitted By: Kent J. Bradford

Crops and Countries:

India: tomato, watermelon, cucumber, onion

Nepal: tomato, cucumber, onion, okra

Thailand: bitter gourd, marigold

Project Objectives:

1. To develop simple, cost-effective, and practical equipment packages for drying and storing horticultural seeds using a novel water-absorbing Zeolite desiccant.
2. To conduct pilot projects with several horticultural species in India, Nepal and Thailand to demonstrate the value of seed drying for enhancing storage life and quality.
3. To write, translate and disseminate information and conduct training sessions about proper postharvest management to maintain high planting quality (vigor and viability) of stored horticultural seeds.



Drying beads can be repeatedly dried and reused.

Problems Addressed:

Initially, much of our activity during this quarter was occupied by getting the contracts completed to put the funds in the hands of our foreign collaborators. That has been accomplished now. In addition, the process of purchasing and distributing equipment and supplies to the entire partner countries was much more time consuming and expensive than we had anticipated. Getting these materials through local customs and duties processes delayed their arrival. However, we persevered through these difficulties and the equipment and necessary materials are now in the hands of all collaborators.

Major Activities and Key Outputs:

Activities have focused on collecting seeds for the storage studies and initiating the seed drying and storage protocols. Seed samples have been collected in India and Nepal for use in the studies. In India, seeds have been placed into dry storage using the desiccant beads in 3 locations. In Nepal, seeds have been collected and their initial quality is being assessed. Storage comparison studies will also be conducted. Demonstrations and educational meetings are being planned.

In Thailand, a first workshop was held on Friday the 21th of May. This workshop was organized in cooperation with the Thai agricultural department at the Thai Rice Seed Center in Phitsanuloke. Participants came from the different seed centers placed throughout Thailand. During this meeting we explained the advantages of working with drying beads and gave some demonstrations thereof.

Protocols and guidelines have been developed for utilizing the desiccant beads and these have been translated into Telugu and Thai. Additional educational materials are being developed, targeted to the audiences anticipated in the different locations.

Summarized Approach to Creating Impact:

Co-PI Van Asbrouck has had discussions with the Thai and Malaysian governments about implementing desiccant-based seed drying on a larger scale in both countries.

Contacts have been initiated with the AVRDC experiment station in Thailand. AVRDC plans to perform some additional seed storage trials. Follow-up meetings and visits have been scheduled.

Seed days and training sessions have been scheduled in India to introduce the concept of dry seed storage to farmers and seed companies. Discussions with the Department of Agriculture have expanded instruction to include oil seeds as these crops lose viability quickly during storage due to lack of controlled storage facilities and prevailing climatic conditions.

A workshop and training is planned in Kathmandu, Nepal, for staff of the regional seed centers to implement the storage protocols.

A seed technology training course scheduled for the next quarter in Thailand will focus a day of the week-long program on principles and procedures for desiccant-based seed drying and storage.

Impact:

The drying beads are now already successfully implemented in drying flower (marigold) seeds by AFM seed company in Chaing Mai, Thailand. There the seeds are dried till extreme low seed moisture contents (4% SMC) in order to keep the seeds viable for a much longer time.

In Nepal, a private seed company has shown interest in using the polymer for storing soybean and groundnut (peanut) seeds in bulk which are very difficult to have safe storage due to infestation of saprophytes and food value of the grains deteriorates. He would like to explore the possibility of safe storing of seeds in bulk.

*II. Sustainable production and marketing of vegetables in Central America*

Implementing Team: Jim Nienhuis, Peter Hanson, Paul Gniffke, Doris Hernandez, Edgar Ascensio, Martha Moraga, Maria de los Angeles, Francisco Salmeron, Tomas Laguna, and Donald Breazeale

Report Submitted By: Jim Nienhuis

Crops: tomato and pepper

Countries: El Salvador, Honduras, Nicaragua, and Costa Rica

Project Objective:

Reduce risk in small-scale, sustainable vegetable production through development of appropriate technology and better adapted cultivars

Problems Addressed:

1. Need for vegetable cultivars with resistance diseases endemic in Central America
2. Need for systematic evaluation of vegetable cultivars on regional scale
3. Need for training in sustainable vegetable production technology
4. Need for development of vegetable market systems

Major Activities and Key Outputs:

1. In cooperation with women's cooperatives evaluated (or in the process of evaluation) 50 AVRDC cultivars in each of four locations (Honduras, El Salvador, Nicaragua and Wisconsin)
2. Field day with 50 local growers completed in Honduras
3. International workshop on Sustainable Vegetable Production and Marketing completed with 19 total participants from Central America. Twenty certificates were issued to participating students, growers, community leaders and educators. Ten of the twenty participants were women.

Summarized Approach to Creating Impact:

The evaluation of germplasm in each target country not only provides direct information on adaption of vegetable cultivars but also provides a focus for the organization of local field days, regional workshops and international certificate training

Impact:

19 participants (8 of whom were women) completed professional certificate training at a University of Wisconsin workshop on organic and sustainable vegetable production and marketing.

## SECTION FOUR - ACTIVITIES

### CENTERS OF EXCELLENCE

*Michael S. Reid, Leader of Implementation of Innovative Technology and Special Projects*

An important component of the Horticulture CRSP core budget is to fund Centers of Excellence in the project's target regions. These centers are intended to serve as a regional window and billboard for the Horticulture CRSP, to provide convenient physical locations where information



Centers of Excellence will be places for farmers to learn novel technologies.

developed or synthesized by the researchers in the Horticulture CRSP collaboration can be provided to clientele, to provide facilities and assistance for regional 'in person' and 'virtual' training activities, to serve as a hub for the Horticulture CRSP's information network, and to foster collaborations among regional and U.S. researchers in programming and in responding to RFPs.

The relatively modest funds allocated to these Centers will provide start-up funds for staff, office supplies, programmatic leadership, coordination, and oversight, but the intent is to establish centers that will be sustainable throughout the life of the project and beyond.

Accordingly, we have spent the first year assessing institutions that have expressed interest and are potential sites for Horticulture CRSP Centers in Central America, South and South-east Asia, and East and West Africa.

Centers will be established at recognized institutions with a regional focus and interest in research and training in horticulture. Almost certainly, the host institutions will already be involved in Horticulture CRSP Project activities, and will be committed to ensuring the sustainability of the center.

In the coming year we expect to complete negotiations to establish the first of the Centers, and will involve our project PIs, as well as the International Advisory Board in establishing and evaluating their activities.

### SPONSORED AND CO-SPONSORED WORKSHOPS

*Elizabeth J. Mitcham, Associate Director*

*Diana Puccetti, Office and Event Planning Assistant*

*Paul Marcotte, International Programs Office*

#### *Inception Workshop*

On May 16-18, 2010, the Horticulture CRSP held its Inception Workshop in Singapore. Ninety five participants from 34 countries around the world joined the Hort CRSP Management Team in a lively discussion about the potential for horticulture development to reduce poverty and

improve livelihoods around the world. Participants debated and evaluated the highest priorities and most effective approaches to achieve these goals. Highlights from the program included an inspiring keynote address by James Simon from Rutgers University, Enterprise development in rural areas – the case for high value horticulture, which kicked off the workshop. Robert Paull from the University of Hawaii at Manoa provided an overview of the Global Horticulture Assessment that served as the foundation for the development of the Horticulture CRSP, George Wilson from North Carolina State University provided an overview of USAID's new Food Security or Feed the Future program, and Gloria Androa of Reach your Destiny presented the challenges for woman and other oppressed groups to become effectively engaged in horticultural activities. Throughout the workshop, the Horticulture CRSP Management Team presented details of our new CRSP program objectives and priorities, themes, upcoming activities, and opportunities for funding. The workshop ended on a positive note with presentations of successful horticulture development activities by Robert Holmer of AVRDC in Thailand, Lisa Kitinoja, Private Consultant, and Bertha Mjawa from the Ministry of Agriculture in Tanzania. A full report of the workshop can be found in Appendix IV.

#### POSTERS, PRESENTATIONS, AND PUBLICATIONS

*Elizabeth J. Mitcham, Associate Director*

*Mark A. Bell, Leader of Communications and Information Transfer*

During the first year, the Horticulture CRSP Management Entity presented a number of posters and PowerPoint presentation about our program at a variety of venues including several international conferences and our Inception Workshop. In addition, numerous brochures and fact sheets were prepared for sharing with colleagues, Mission personnel, and other interested in development to share the vision of Horticulture CRSP. A list of these posters, presentations and publications are given below and copies of the posters and publications are found in Appendix V.

#### Posters

- Immediate Impact Projects Hort CRSP – Inception Workshop, Singapore, May 2010
- Postharvest Gordon Conference - Horticulture Collaborative Research Support Program, July 2010
- ASHS – Horticulture Collaborative Research Support Program, July 2010
- ISHS - IHC2010 - Lisbon, Portugal, August 22-27, 2010, Immediate Impact Projects Quickly Address Horticultural Needs in Developing Countries

#### Presentations

- Launch presentation Oct. 27, 2009
- Pomology Extension Continuing Conference - Horticulture Collaborative Research Support Program, March 2010
- Vegetable Extension Continuing Conference - Horticulture Collaborative Research Support Program, November 2009
- ASHS – Horticulture Collaborative Research Support Program, July 2010
- Bill and Melinda Gates Foundation, Hort CRSP Overview July 2010
- Dean's Advisory Council - Horticulture Collaborative Research Support Program, October 2010
- International Society for Horticultural Sciences – International Horticultural Congress 2010 - Lisbon, Portugal, August 22-27, 2010, Immediate Impact Projects Quickly Address Horticultural Needs in Developing Countries.

- Malaysian Postharvest Conference (Robert Paull) - Malaysian Postharvest Conference, Nov-Dec. 2010, Horticulture CRSP, a long term commitment by USAID to address poverty and hunger of the rural poor in developing countries.
- Indian Horticulture Congress (Poon Kasemsap) – Nov 2010

Publications

- Nutrition fact sheet
- Horticulture for Poverty Reduction
- Feed the Future Fact Sheets – West Africa, East Africa, East and South Africa, South Asia, Southeast Asia, South and Southeast Asia, Central America
- Immediate Impact Project Fact Sheet
- Immediate Impact Project Brochure
- Hort CRSP Brochure

APPENDIX I. INFORMATION MANAGEMENT STRATEGY.



Initial strategy notes:

## **1. Horticulture CRSP Audience**

- 1.1. Farmers
  - 1.1.1. What they need: Money, problem diagnosis, production, markets, inputs, food safety
  - 1.1.2. Characteristics to Consider: Literacy, information access
  - 1.1.3. Note to selves: Think about cooperatives
  - 1.1.4. Issues
    - 1.1.4.1. Languages, Mobile access
- 1.2. Intermediaries
  - 1.2.1. Processors
    - 1.2.1.1. What they need: Money, post harvest, increased quality/quantity, increased sales, market development, food safety
  - 1.2.2. Boundary Spanners
    - 1.2.2.1. What they need: Problem identification, production information, postharvest information, markets?, delivery methods
    - 1.2.2.2. Who they are: University, NARES, NGOs
    - 1.2.2.3. Note to selves: Generate a Toolbox of Information for Them
- 1.3. Researchers
  - 1.3.1. What they need: Money, projects, identify potential partners (others looking for LGUs)
  - 1.3.2. Expected products
    - 1.3.2.1. Good technology
    - 1.3.2.2. Extension material
    - 1.3.2.3. Reports
    - 1.3.2.4. Publications

## **2. Tools**

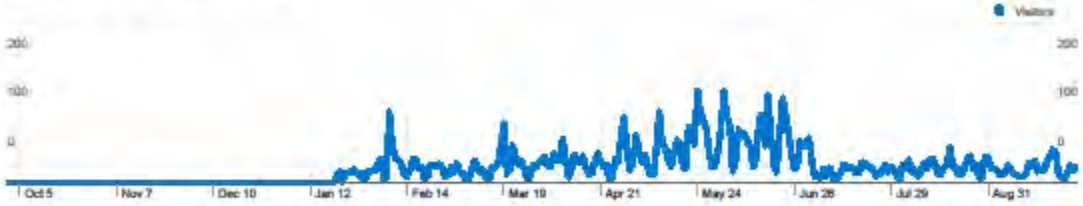
- 2.1. Web based
- 2.2. Phone based
- 2.3. New Technologies

## **3. Public Awareness**

- 3.1. Starts with our website
  - 3.1.1. Overview
  - 3.1.2. Projects
    - 3.1.2.1. Summary, activities, countries, partners, reports, ongoing, completed
    - 3.1.2.2. Impact
  - 3.1.3. Newsletter
    - 3.1.3.1. GHI workshops
  - 3.1.4. Global Issues
  - 3.1.5. Partners
    - 3.1.5.1. Existing, potential
  - 3.1.6. Dynamic elements

APPENDIX II. WEBSITE REPORT.

hortersp.uodavis.edu  
**Visitors Overview**  
Oct 1, 2009 - Sep 30, 2010  
Comparing to: Site



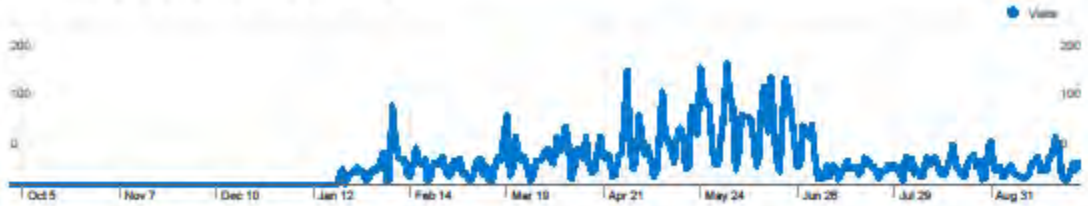
**3,961 people visited this site**

- 9,687 Visits**
- 3,961 Absolute Unique Visitors**
- 37,454 Pageviews**
- 3.87 Average Pageviews**
- 00:03:54 Time on Site**
- 43.31% Bounce Rate**
- 40.80% New Visits**

**Technical Profile**

Browser	Visits	% visits	Connection Speed	Visits	% visits
Internet Explorer	4,340	44.80%	T1	4,377	45.18%
Firefox	3,143	32.45%	Unknown	2,700	27.87%
Safari	1,689	17.44%	DSL	1,398	14.43%
Chrome	457	4.72%	Cable	1,006	10.39%
Opera	26	0.27%	Dialup	175	1.81%

hortcrsp.ucdavis.edu  
**Traffic Sources Overview**  
Oct 1, 2009 - Sep 30, 2010  
Comparing to: Site



All traffic sources sent a total of 9,687 visits

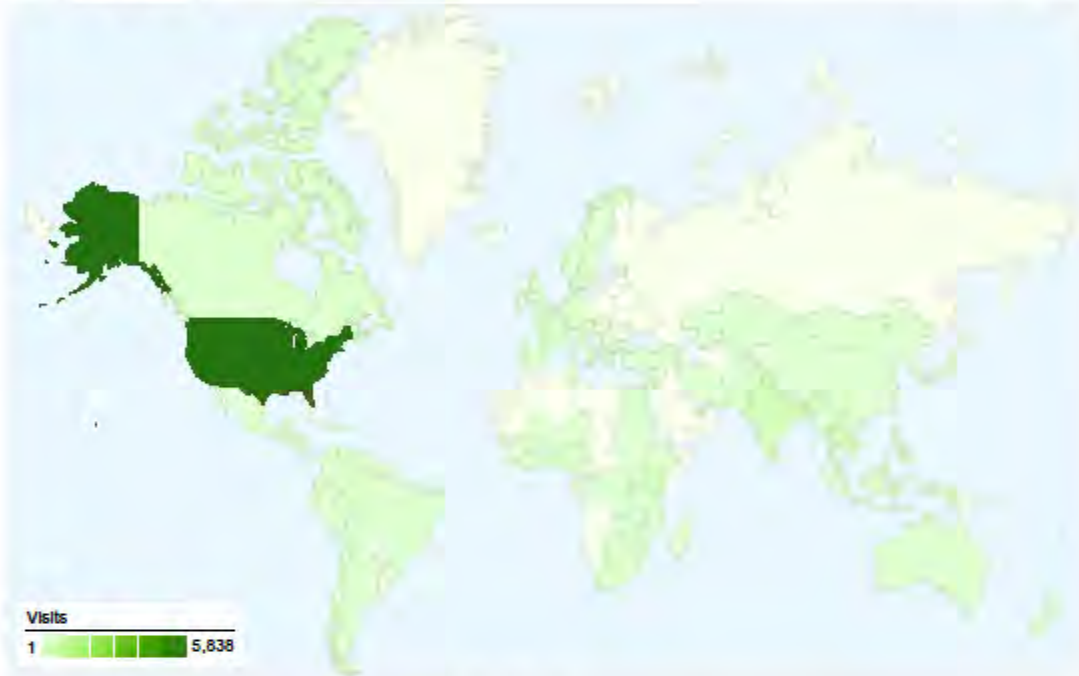


**Top Traffic Sources**

Sources	Visits	% visits	Keywords	Visits	% visits
(direct) ((none))	5,161	53.28%	hort crsp	832	28.71%
google (organic)	2,711	27.99%	hortcrsp	398	13.66%
globalhort.org (referral)	294	3.03%	horticulture crsp	151	5.21%
maps.google.com (referral)	122	1.26%	hort crsp uc davis	102	3.52%
us.mg2.mail.yahoo.com	97	1.00%	uc davis hort crsp	63	2.17%

hortersp.uodavis.edu  
**Map Overlay**

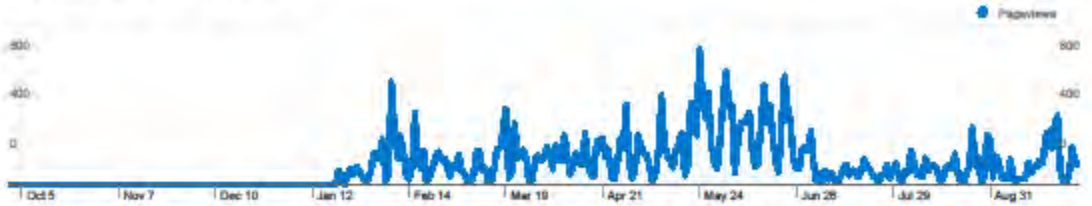
Oct 1, 2009 - Sep 30, 2010  
Comparing to: Site



**9,687 visits came from 122 countries/territories**


Site Usage					
Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate	
<b>9,687</b>	<b>3.87</b>	<b>00:03:54</b>	<b>40.90%</b>	<b>43.31%</b>	
% of Site Total: 100.00%	Site Avg: 3.87 (0.00%)	Site Avg: 00:03:54 (0.00%)	Site Avg: 40.80% (0.25%)	Site Avg: 43.31% (0.00%)	
Country/Territory	Visits	Pages/Visit	Avg. Time on Site	% New Visits	Bounce Rate
United States	5,838	3.90	00:03:26	37.38%	42.27%
Thailand	388	5.93	00:06:22	55.93%	31.19%
India	358	4.59	00:06:05	45.53%	33.24%
Kenya	266	3.02	00:03:19	33.08%	63.91%
Chile	170	2.32	00:01:21	7.06%	32.94%
France	169	2.73	00:02:36	41.42%	53.25%
Singapore	152	2.88	00:03:01	30.26%	47.37%
Vietnam	134	4.31	00:06:01	46.27%	35.82%
South Africa	110	4.59	00:06:07	41.82%	36.36%

hortersp.uodavis.edu **Content Overview** Oct 1, 2009 - Sep 30, 2010  
Comparing to: Site



Pages on this site were viewed a total of 37,454 times

 37,454 Pageviews

 25,874 Unique Views

 43.31% Bounce Rate

### Top Content

Pages	Pageviews	% Pageviews
/	5,457	14.57%
/main/rfp2010.html	3,338	8.91%
/main/projects.htm	2,786	7.44%
/main/funding.htm	1,922	5.13%
/main/workshop.html	1,806	4.82%

APPENDIX III. NEWSLETTERS AND ARTICLES.



# Horticulture CRSP News

## Introducing Horticulture CRSP

The US Agency for International Development has provided funds to support research into issues affecting horticultural production and marketing in the developing world, following the recommendations of the Global Horticulture Assessment.

### Priority Issues:

- Sustainable Crop Production
- Postharvest Technology
- Food Safety
- Market Access
- Financing

### Themes:

- Information Accessibility
- Technology Innovation
- Gender Equity

### Outputs:

- Improved national capacity of developing countries to support the poor through enhanced horticultural systems
- Improved food security, nutrition, and human health
- Improved and diversified incomes



*Reducing poverty, improving nutrition and health, and improving sustainability and profitability through horticulture.*

Volume 1, Issue 1, February 2010

## Immediate Impact Projects Begin

Horticulture CRSP has awarded nearly \$2 million in funding to 15 Immediate Impact Projects (IIPs). The IIPs offer Horticulture CRSP and the U.S. Agency for International Development (USAID) to quickly fund short-term projects. Designed to be "shovel-ready", the successful projects are funded for one-year beginning February 1, 2010.

Projects range in focus from food safety to postharvest issues and encompass a wide variety of horticultural crops including spices, potatoes, cacao, leafy green vegetables, papaya, and tomatoes. Principal investigators represent ten U.S. universities and a range of expertise. Projects include improving market access for rooibos tea farmers, introducing new technologies for cold storage for small-scale farmers, developing new drying and storage techniques, and advancing nutrition through fruit and vegetable promotion. Projects will span the globe from Ghana to Honduras to Sri Lanka.

Horticulture CRSP received over 180 pre-proposals. Proposals were reviewed by the Program Council and outside, anonymous reviewers and were selected for funding based on scientific merit, their ability to impact developing country needs, participation from international universities and organizations, commitment to gender equity, and project evaluation. Successful proposals were consistent with Horticulture CRSP objectives and priority issues.

"The level of interest in the IIP process is amazing. It is exciting to see the number of horticultural scientists interested in development work and in many cases already actively engaged in this area. We are looking forward to the impact these initial 15 projects will make in the lives of the rural poor." says Associate Director and IIP Chair Elizabeth Mitcham.

The varied projects guarantee that the Horticulture CRSP will make an immediate impact with its funding from USAID and ensures that research and education activities take place in developing countries throughout the entire CRSP project period. For more details on the IIPs, visit <http://hortcrsp.ucdavis.edu>.



Horticulture Collaborative Research Support Program • Department of Plant Sciences  
University of California, Davis • One Shields Avenue • Davis, CA 95616-5270  
1.530.752.7979 (voice) • 1.530.752.7182 (fax)  
[hortcrsp@ucdavis.edu](mailto:hortcrsp@ucdavis.edu) • <http://hortcrsp.ucdavis.edu>



# HortCRSP News

## Program Council Named

The management team of Horticulture CRSP has assembled a Program Council to guide activities until the International Administrative Board is appointed. The members of the Program Council will augment Horticulture CRSP with a diversity of scientific expertise and international experience, and help lead the program through the complexities of scientific research and international development. They will also ensure that the results of Horticulture CRSP reflect its original mission and objectives.

The members of the Program Council have three main duties.

1. Select and recommend the appropriate Immediate Impact Projects (IIPs).
2. Counsel the director on technical and management issues that concern the implementation of the IIPs.
3. Appoint the members of an International Administrative Board (IAB) that will take over the roles and

responsibilities of the Program Council. The IAB will ensure the long-term focus and results of Horticulture CRSP. Approximately four members of the Program Council will be appointed to the IAB to maintain continuity.

The Program Council members have been selected based on their horticultural expertise and international experience. The four members of the Horticulture CRSP's management team will also participate as ex-officio members on the council.

The Program Council members are Elizabeth Mitcham (Chair), Ron Voss, Mark Bell, Michael Reid, Diane Barrett, Alan Bennett, Patrick Brown, Adel Kader, and Steve Brush from University of California, Davis, George Wilson from North Carolina State University, Robert E. Paull of University of Hawaii at Manoa, and K.V. Raman from Cornell University.

## Immediate Impact Projects

### By the numbers:

- 15 projects
- 10 institutions
- 8 projects in Africa
- 4 projects in Central America
- 2 projects in South Asia
- 1 project in multiple regions
- Nearly \$2 million awarded!



### Project Focus

- Training environment
- Food safety
- Nutrition
- Sustainable production
- Extension

### Upcoming...

Inception Workshop—tentatively scheduled for late May

Next Call for Proposals will be in early Summer—check our website for the call at <http://hortcrsp.ucdavis.edu>

Join our email list by visiting our website and clicking on "Contact Us".

This newsletter is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under Award No. EPP-A-00-09-00004. The contents are the responsibility of Horticulture CRSP and do not necessarily reflect the views of USAID or the United States Government. Edited by Amanda Crump



# Horticulture CRSP News



*Reducing poverty, improving nutrition and health, and improving sustainability and profitability through horticulture.*

Volume 1, Issue 2, June 2010

## In this issue

- Request for Proposals
- Inception Workshop
- Collaborations and Partnerships
- Request for Reviewers
- International Advisory Board

## Online Now!

- [New look!](#)
- [Find a Collaborator](#)
- [Request for Proposals](#)
- [Worldwide Horticulture Projects](#)

## Upcoming Online and in the News

- [Inception Workshop Presentations, Video, and Posters](#)
- Horticulture CRSP Travels
- Immediate Impact Project Success Stories

## Request for Proposals

### Proposals for One-Year Exploratory Projects - Due July 1, 2010

Grants funded by the Horticulture CRSP require the participation of Principal Investigators from a qualified US university or universities, and colleagues from Universities, Government or Private Institutions, and/or NGOs in target countries in the developing world. We recognize that many researchers in the U.S. and in developing countries have the interest and capability to conduct appropriate research and training programs, but have not developed the teams or the background information that would ensure success in an application for a Pilot Project (the major grants funded by the Horticulture CRSP). The intent of the Horticulture CRSP Exploratory Projects is to provide funding that will encourage formation of such teams and the acquisition of background or preliminary information, or proof of concept(s) that can provide the basis for a competitive Pilot Project application. Exploratory Projects will be funded for one year, from October 1, 2010 to September 30 2011. Approximately \$750,000 will be devoted to the Exploratory Project Award program. The maximum amount awarded per project will be \$75,000.

## Reviewers Needed

Horticulture CRSP is looking for reviewers for proposals. If you are interested in reviewing proposals, please email [hortcrsp@ucdavis.edu](mailto:hortcrsp@ucdavis.edu) and indicate your

- 1) name
- 2) institution/organization
- 3) email address
- 4) your expertise in the following areas: Market Systems, Postharvest Systems and Food Safety, Sustainable Production Systems, Capacity Building, Enabling Environment (policy, finance, infrastructure, etc), Gender and Horticultural Development, and Nutrition and Human Health.



Horticulture Collaborative Research Support Program • Department of Plant Sciences  
University of California, Davis • One Shields Avenue (190 EH Bldg) • Davis, CA 95616-5270  
1.530.752.3522 (voice) • 1.530.752.7182 (fax)  
[hortcrsp@ucdavis.edu](mailto:hortcrsp@ucdavis.edu) • <http://hortcrsp.ucdavis.edu>

## Inception Workshop

The Horticulture CRSP held its Inception Workshop, May 16-18, 2010, in Singapore. Ninety five participants from 34 countries around the world joined the Hort CRSP Management Team in a lively discussion about the potential for horticulture development to reduce poverty and improve livelihoods around the world. Participants debated and evaluated the highest priorities and most effective approaches to achieve these goals. Highlights from the program included an inspiring keynote address by James Simon from Rutgers University, "Enterprise development in rural areas – the case for high value horticulture", which kicked off the workshop. Robert Paull from the University of Hawaii at Manoa provided an overview of the Global Horticulture Assessment that served as the foundation for the development of the Horticulture CRSP, George Wilson from North Carolina State University provided an overview of USAID's new Food Security program, and Gloria Androa of Reach Your Destiny, LTD presented the challenges for woman and other disadvantaged groups to become effectively engaged in horticultural activities. Throughout the workshop, the Horticulture CRSP Management Team presented details of our new CRSP program objectives and priorities, themes, upcoming activities, and opportunities for funding. The workshop ended on a positive note with presentations of successful horticulture development activities by Robert Holmer of AVRDC, Lisa Kitinoja, Private Consultant, and Bertha

Mjawa from the Ministry of Agriculture Food Security and Cooperatives in Tanzania. The nearly 100 participants continuously networked with each other to develop new informal and formal relationships, including partnerships and collaboration for Hort CRSP Pilot and Exploratory Projects, for which the RFP's were announced during the Inception Workshop. Thirty-five posters describing the 15 current Hort CRSP Immediate Impact Projects and numerous other projects and organizations provided a natural forum for many of these informal discussions.

The Horticulture CRSP Management Team would like to express our sincere gratitude to Dr. Shirley Lim and her staff at the National Institute of Education at Nanyang Technical University for hosting the workshop in short notice after the venue was changed due to the unrest in Thailand. We would also like to sincerely thank Dr. Poonpipope Kasemsap and his colleagues at Kasetsart University in Thailand who worked several months with us to plan the workshop at Kasetsart University, and graciously assisted us to find a fantastic facility and cooperator in Singapore when it became clear we needed to move the venue. Finally, hats off to our fantastic staff at Horticulture CRSP, particularly Diana Puccetti, Events Planner, who worked tirelessly to achieve a successful workshop for all participants.

—Elizabeth Mitcham, Associate Director

## Mapping Worldwide Horticulture Development Projects

Horticulture CRSP and The Global Horticulture Initiative are mapping horticultural development projects in order to populate an online resource that enables funding agencies and project creators to learn about existing projects, find potential linkages and identify areas of need. The maps can be found at <http://hortcrsp.ucdavis.edu/main/worldprojects.html>.

The maps of current projects will enable donors, researchers and development workers to find out who is active, build collaborations and create complementary projects. The maps of completed projects will provide a better understanding of what work has been done in a given country or region. The intent is not only to provide an overview, but also to enable users to access detailed information on individual projects, seek out past project implementers and learn about what worked and what did not.

Please help us improve this resource by sending us information about your horticultural projects in the developing world. Please visit <http://hortcrsp.ucdavis.edu/main/projectsurvey.html> and fill out our short survey for each of your horticultural projects.

— Peter C. Shapland, Graduate Research Assistant

## Horticulture CRSP Creates International Advisory Board

Horticulture CRSP has named members of its International Advisory Board (IAB). The IAB will be the senior advisory council to the Horticulture CRSP.

The IAB will appoint the technical review panels for Horticulture CRSP projects and review the panels' recommendations to ensure that Horticulture CRSP priorities are met and integrated for maximum effectiveness. The IAB will help set priorities, allocate the budget, and ensure that USAID, Global Horticulture Assessment and Horticulture CRSP objectives are met.

The IAB held its first meeting on May 19, 2010 after the Horticulture CRSP Inception Workshop in Singapore.

"The Horticulture CRSP Management Entity is happy to add this group of highly qualified, diverse and enthusiastic individuals to our team," Director Ron Voss notes. "The board completes the management team committed to the goal of reducing poverty and hunger through horticulture."

### Members of the International Advisory Board

*L. George Wilson, Ph.D., Chair* - Professor of Horticultural Science at North Carolina State University and former Senior Advisor for University Relations and Agriculture Research, Training and Outreach, and Chief of Party of the Peru Mission for USAID.

*Lusike A. Wasilwa, Ph.D., Vice Chair* - Assistant Director in charge of the Horticulture and Industrial Crops Division at the Kenya Agriculture Research Institute.

*Deborah Pierson Delmer, Ph.D.* - Private Consultant to foundations and government agencies in the area of plant biotechnology; Professor Emeritus in Plant Biology, UC Davis; former Program Director, BREAD program of U.S. National Science Foundation; and former Associate Director for Food Security for The Rockefeller Foundation.

*Adel A. Kader, Ph.D.* - Professor Emeritus of Postharvest Physiology in the Department of Plant Sciences, University of California, Davis.

*Poonpipope Kasemsap, Ph.D.* - Associate Professor of Crop Eco-Physiology, Chair of the Horticulture Department, and Director of the International Studies Center at Kasetsart University in Bangkok, Thailand.

*J.D.H. Keatinge, Ph.D.* - Director General of AVRDC - The World Vegetable Research and Development Center based in Taiwan and Vice-Chairman of the Global Horticultural Initiative.

*Norman E. Looney, Ph.D.* - President of the International Society for Horticultural Science and Board Chair of the Board of Directors of the Global Horticulture Initiative.

*Howard Yana Shapiro, Ph.D.* - Corporate Staff Officer of Plant Science and External Affairs at Mars, Inc. and Adjunct Professor in the Department of Plant Sciences at University of California, Davis.



### Horticulture CRSP Projects in Action

#### *Sustainable Production and Marketing of Vegetables in Central America*

— James Nienhuis, University of Wisconsin-Madison

Families in the Morazon region of El Salvador are growing vegetables for the first time, marketing the excess, and providing extra income for their families.

This newsletter is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under Award No. EPP-A-00-09-00004. The contents are the responsibility of Horticulture CRSP and do not necessarily reflect the views of USAID or the United States Government. Edited by Amanda Crump

APPENDIX IV. INCEPTION WORKSHOP REPORT.



### **Inception Workshop**

**May 16-18, 2010**

**Supported by: USAID & Hort CRSP**

**Hosted by: National Institute Education, NTU, Singapore  
Kasetsart University, Bangkok, Thailand**

### **Event Evaluation**

In October, 2009, the University of California, Davis was awarded the Management Entity of the newly formed Horticulture Collaborative Research Support Program (Hort CRSP) funded by the U.S. Agency for International Development (USAID). The program will support research, education and extension projects led by U.S. public universities in collaboration with developing country partners to enhance horticultural crop production, postharvest handling, processing and marketing by resource poor farmers in the developing world. In January 2010, 15 one-year, immediate impact projects (IIP) were funded on a variety of topics.

The Inception Workshop was held in Singapore May 16-18 and brought together investigators working on these initial Hort CRSP projects along with others from the U.S. and developing countries interested in horticulture development work and future collaborations with Hort CRSP.

At the conclusion of the workshop an Event Evaluation was distributed and completed by 56 participants. The workshop by all measures was considered to be a resounding success, with objectives achieved, components very strong, and a great opportunity for the HortCRSP to begin its 5 year program. The following report summarizes the results of the evaluation.

**Part 1: Overall workshop:** Part 1 of the event evaluation assessed the achievement of the overall objectives of the workshop. Participants were requested to indicate the achievement of the 4 workshop objectives. The results indicate that the workshop was

successful and achieved each of its objectives. The following were the objectives of the workshop:

**Objective 1: Understand the Horticulture CRSP objectives**

**\_91%\_Achieved      \_9%\_Partially Achieved      \_0%\_Not Achieved**

All participants indicated that the workshop reached its objective of enabling them to understand the HortCRSP Objectives. An overwhelming majority of 91% indicated that the workshop objectives were completely achieved.

**Objective 2: Confirm priority issues and opportunities in Horticulture Development**

**\_76%\_Achieved      \_22%\_Partially Achieved      \_2%\_Not Achieved**

All participants indicated that the priority issues and opportunities were confirmed (76% fully achieved and 22% partially achieved, while only 1 participant indicated they were not. The one outlier only partially filled out the evaluation form in a negative way with no comments or information about the content.)

**Objective 3: Network with potential collaborators. Get acquainted with the Hort CRSP Management Entity and the International Advisory Board members.**

**\_80%\_Achieved      \_18%\_Partially Achieved      \_2%\_Not Achieved**

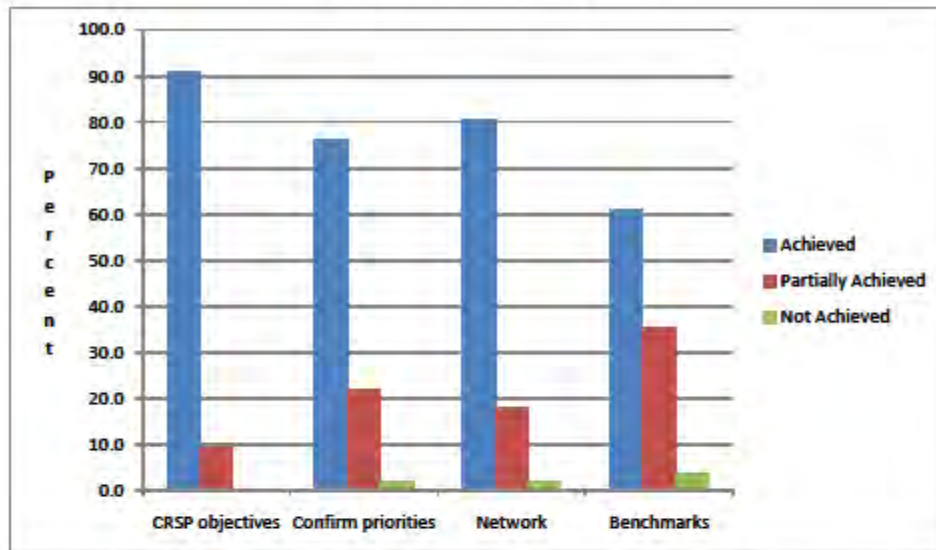
All participants indicated that the workshop provided them with the opportunity to network with collaborators and become acquainted with the ME and IAB members, with 80% fully achieved.

**Objective 4: Discuss Hort CRSP project benchmarks and assessment methods**

**\_61%\_Achieved      \_35%\_Partially Achieved      \_4%\_Not Achieved**

As with the objectives above, Objective 4 was met by an overwhelming majority. It is not surprising that this objective had 35% participants showing this objective as "partially achieved" as the plenary session was only a brief overview on benchmarks and assessment method. A full session with more comprehensive coverage of benchmarks and process was included during the regional breakout component, and was very highly rated.

### Inception Workshop Objectives



Part 1 of the Event Evaluation also requested that the participants indicate Strengths and Weaknesses of the workshop in a narrative form. There were 158 responses to the request to list strengths. Of these 158 responses, there were 2 easily identifiable clusters of strengths as follow:

#### Strength 1: Content

Participants listed the primary strength of the workshop as the content (51%). This cluster included opportunities for networking, country and expertise representation, clarification of HortCRSP objectives, description of successful projects and discussion of issues.

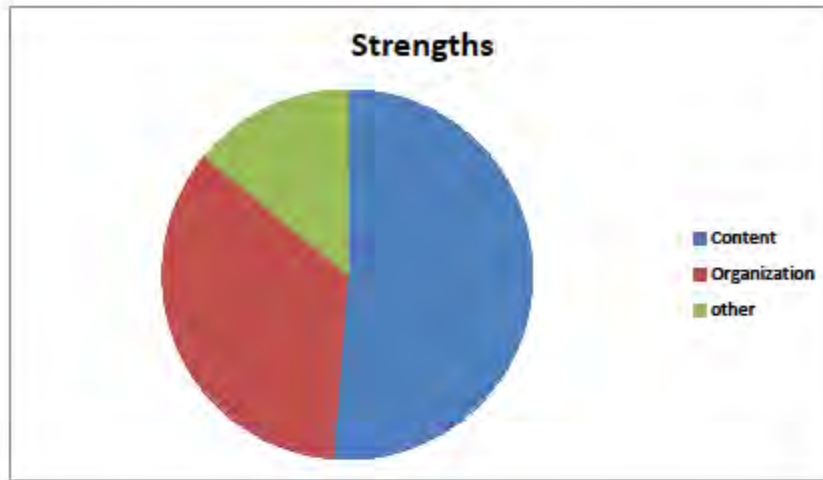
#### Strength 2: Organization

The secondary strength of the workshop was organization (35%). This strength discussed how well the workshop was organized, the format, the leadership team, and the honesty of the facilitators.

#### Strength 3: Other

The remaining strengths identified were singular and included both content and organizational issues such as high participation of women, appropriateness and transparency.





With respect to the weaknesses of the workshop, in total the participants identified 101 weaknesses.

**Weakness 1: Time**

Most of the weaknesses in the primary category were a positive statement about the importance of the workshop content: i.e. participants wanted more time for the workshop. This included the entire workshop, breakout sessions, informal discussions, and the tightness of schedule.

**Weakness 2: Distance**

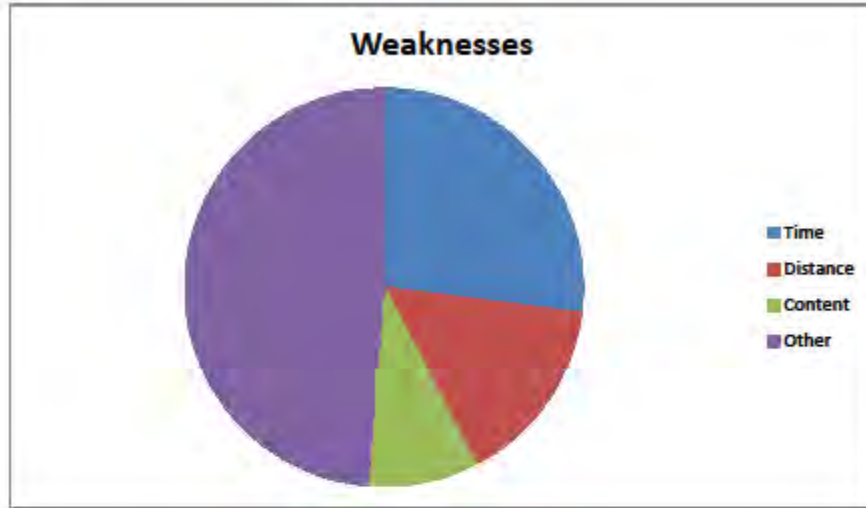
This category included both the distance to Singapore and the distance from the hotel to the workshop venue. Given the last minute changes due to the civil unrest in Thailand, there 'weaknesses' were unavoidable.

**Weakness 3: Content**

This 'weakness' is similar to the Time weakness identified above. Participants wanted more details, more field visits and better organized elements such as the poster room.

**Weakness 4: Other**

The remaining 54 comments were singular and included needs for more organization, less representation, donor collaboration, unknown speakers, etc.



**Part 2: Components of the workshop**

The participants were requested to rate the topics of the workshop. For each of the following components of the workshop, they were requested to check the appropriate column and provide comments as appropriate. 5=excellent; 4=good; 3=average; 2=fair; 1=poor.

Topic	Rating 5,4,3,2,1	Comments
<b>Day 1: Monday May 17</b>		
Keynote address: Enterprise development in rural areas – the case for high-value horticulture	4.69	Informative, Fantastic, Inspiring, great choice of topic, Thorough, excellent, needs a Handout, excellent, unbelievably successful, excellent, inspiring, technology requires buy-in
Overview: The global horticulture assessment	4.07	better structuring, poorly summarized, technical difficulties, good, very good
Hort CRSP Objectives, Activities and Opportunities	4.38	Be more enthusiastic, activities not clear, very well covered
Poster session	3.94	Diverse, good learning Experience, people stayed in hallway, useful in networking, bad poster boards, high quality posters
Monitoring and Evaluation overview	4.04	needs clearer objectives, Clarified a lot, very clear, useful, excellent
<b>Breakout Sessions by Region</b>		
Sub-Saharan Africa	4.00	very good session, thoughtful
Southeast Asia	4.12	Thoughtful, interesting Exchange, difficult to prioritize
South Asia	4.19	Thoughtful, very focused, very professional

Fantastic

poorly sum

Latin America	4.05	Thoughtful, didn't develop projects, needed more participants, not enough time
Monitoring and Evaluation (with one representative from each IIP)	4.30	Good inclusion of IIP, useful, thoughtful
<b>Day 2: Tuesday May 18</b>		
<b>Hort CRSP Theme overview</b>		
Gender equity	4.47	not all small scale are biased, good, maybe more gender overall-not just women, very stimulating, best of the meeting, excellent
Information accessibility	4.39	don't forget the consumer, superb overview, precise, why?
Innovative technologies	4.33	good start to make us think, thoughtful, new information, excellent and challenging, more time for brainstorming
Food Security and USAID Hort CRSP Collaborations with other CRSPs	4.22	now we know how projects can be funded, educational, very important, should have been on Monday, somewhat redundant, well presented
<b>Breakout Sessions</b>		
Markets and market access	4.33	need to include market experts, focused
Women in high value horticulture	4.33	good ideas, flamboyant but interesting, spirit was good
Postharvest handling	4.37	well done, focused, excellent
Germplasm improvement and seed systems	4.33	focus was on seeds, comprehensive
Sustainable production	4.14	well put together

Microfinance and enabling environment	4.10	active and inspiring, hit the target, comprehensive
<b>Plenary Session</b>		
Breakouts report back issues, obstacles and strategies	4.33	some groups took too long , light on specific strategies, precise
Overview of workshop sessions	4.38	many good issues, excellent, tiring to hear reports, too long, too long
Horticulture and Food Security	4.50	very interesting, very interesting, Kitinoja talk was excellent

### Breakout Sessions by Region

Sub-Saharan Africa	Beth
Southeast Asia	George Wilson
South Asia	Adel Kader
Latin America	Michael Reid
Monitoring and Evaluation (with one representative from each IIP)	<p>M&amp;E. Suggestions for improving the M&amp;E reports (Paul and Amanda using the M&amp;E workshop output).</p> <ol style="list-style-type: none"> <li>1. <b>Materials.</b> Ensure that people can upload their training and extension materials - and make them available - through the Hort CRSP site (Amanda and Mark)</li> <li>2. <b>Sound bites.</b> Submit "Sound bites" for promotion on Hort CRSP web and for submission to USAID Frontlines (Mark and Amanda)</li> <li>3. <b>Mission visits.</b> Ensure Horticulture promotion materials are available through the Hort CRSP web site (and Pls know about them) to support Mission visits. Perhaps on <a href="http://Hortcrsp.ucdavis.edu">Hortcrsp.ucdavis.edu</a> - include a list</li> </ol>

	of missions visited. (Amanda)
--	-------------------------------

**Added/expanded elements**

Participants were requested to provide elements of the program that should be expanded. There were a number of responses to this question. Since the responses are primarily singular issues and fairly specific, they are more amenable to listing. They are: more project stories 4, additional breakout session to develop strategies 3, field trip 3, more opportunity to network 2, health and nutrition 2, get into more specific issues 1, pests and diseases 1, markets 1, food safety 1, micro financing 1, capacity building 1, encourage team building 1, M&E 1, breakout #2 1, more time for RFP deadlines 1, best practices talk 1, more speakers 1, how to create impact 1 more NGOs 1, breakouts 1, misunderstanding of target vs. non-target countries 1, germplasm 1, sustainable production 1, food security 1, smaller groups 1, more discussion 1, implementation of successful projects 1.

**Deleted elements**

Participants were requested to identify elements of the program that should be deleted. There were only 9 responses to this question, and few of those had to do with 'program issues'. Those were 'less on goals, gender, and bio-tech'.

### Part 3: Additional Factors of the program:

Participants were requested to assess the additional factors of the program. These are factors which can adversely affect the success of the program if they are not sufficient, but usually do not dramatically increase the overall assessment of the workshop in positive terms. According to the "additional factors" of the Inception Workshop, all were satisfactory to excellent with a range of 4.16 to 4.7. For those slightly lower, these are easily correctable for the next meetings. With respect to 'materials', the organizers should make sure that the secretariat has materials available in advance, and that binders are distributed for participants to develop a material's binder. Concerning 'accommodation' and 'food', it was just slightly less than a miracle that Diana and Chelo were able to get such a great place in such short notice. To refresh the reader's memories, the site was switched at the last moment due to civil unrest in Thailand. It was a sterling effort, and providing appropriate transportation to what was clearly a superlative venue, enabled the workshop to be a success.

Factors	Rating 5,4,3,2,1	Comments
Transportation	4.54	Well arranged, perfect, too far from hotel, too comfortable, too far, more on time, excellent, excellent, bus not on time
Accommodation	4.20	Perfect, well chosen, location was good but room was smoky, expensive, closer, poor hotel service, landmark was not good, landmark smelled bad, excellent
Food	4.22	Perfect, more fruit and veggies, more veggies, excellent, very nice, too much food, better tasting, excellent, too oily, too much sugar
Materials	4.16	Perfect, make available earlier, pens, in advance, pens, handouts of talks, need more, bind together
Classroom/ workroom	4.7	Perfect, great rooms, excellent, excellent, cold, excellent, excellent

The final question requested for additional comments from the participants. There were 27 comments in total. The overwhelming majority (25 of 27) of those comments was positive and clearly the participants appreciated the work, the workshop, the content and the efforts made by the HortCRSP staff. There were only 2 two comments that could be perceived as negative: the coldness of the rooms and the cost—which were beyond the control of the organizers.

The most common comment (37%) was that **workshop was excellent** with respect to planning, organizing—'great job'. In a combination of content and process (41%), **participants wanted more content** on seeds, information, networking, expansion of schedule and field tours.

Possibly the most important element of the planning for the workshop was the identification of roles, their significance and .....

Please see the next page as confirmation as to the importance😊😊



**guru**  
*empowers to excel*

# MEETING?

Do you know...

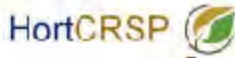
- 1. The Purpose?**
- 2. The Agenda?**
- 3. Your Role?**
- 4. Who is keeping Minutes?**

**IF NOT, Ask the chairperson.**

No meeting should start before every member is clear about all these.

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APPENDIX V. POSTERS AND PUBLICATIONS.



# Immediate Impact Projects

*Fifteen projects dedicated to improving horticulture.*

## Immediate Impact Projects

In February, Horticulture CRSP awarded nearly \$2 million to support 15 one-year projects to improve horticultural crop production and marketing in the developing world. Ten US universities are conducting projects across 20 developing countries.

### Central and South America

Costa Rica  
Dominican Republic  
El Salvador  
Guatemala  
Haiti  
Honduras  
Mexico  
Nicaragua  
Panama

Projects Are Online  
<http://hortcrsp.ucdavis.edu>

- Interactive Map
- Project Summaries
- List of In-Country Collaborators



### Africa

Ghana  
Kenya  
Nigeria  
South Africa  
Tanzania  
Uganda  
Zambia

### South and Southeast Asia

India  
Nepal  
Sri Lanka  
Thailand

The projects encompass a wide variety of horticultural crops and include improving market access for farmers, introducing new technologies for cold storage for small-scale farmers, developing new processing techniques, and advancing nutrition by promoting fruit and vegetable production.

## Projects by Theme

### Postharvest

- Concentrated Solar Drying of Mango and Tomato
- Biological-Based Postharvest Quality Maintenance and Disease Control for Mango and Papaya
- Coolrooms and Cool Transport for Small-Scale Farmers

### Enabling Environment

- Building an Ornamental Plant Industry in Honduras
- Improving Market Access for Emerging South African Rooibos Farmers
- Promoting Fruit and Vegetable Production to Improve Nutrition in Nkokonjeru, Uganda

### Nutrition

- Concentrated Nutritional and Economic Enhancement of Ghanaian Traditional Diets, Using Orange-Fleshed Sweetpotato Products

### Germplasm Improvement

- New Technology for Postharvest Drying and Storage of Horticultural Seeds
- Sustainable Production and Marketing of Vegetables in Central America

### Food Safety

- Enhancing Trade in Horticultural Crops through Food Safety and Phytosanitary Measures

### Sustainable Production

- Deployment of Rapid Diagnostic Tools for Phytophthora on Horticultural Crops in Central America
- Improving Fruit Postharvest Quality through Best Management Practices for Perishable Vegetable Production in Protective Structures
- Sustainable Production of Specialty Horticultural Crops in Ghana for Income Generation and Increased Export Value
- Sustainable Development of Horticultural Crops in Zambia for Food Security, Income Generation and in Support of the Tourism Industry
- Indigenous African Leafy Vegetables (ALV) for Enhancing Livelihood Security of Smallholder Farmers in Kenya





## Horticulture Collaborative Research Support Program

R.E. Voss, E.J. Mitcham, M.S. Reid, M.A. Bell, A. Crump, and A. A. Kader  
HortCRSP, UC Davis, CA 95616

### Abstract

Funded by USAID in 2009, the UC Davis based Horticulture Collaborative Research Support Program (Horticulture CRSP) provides funds for US Universities and their international partners to conduct research and outreach to improve livelihoods and health of the rural poor through high value horticulture. Recognizing the 50 - 80% postharvest losses of horticultural products in the developing world, the Horticulture CRSP has a strong focus on projects addressing postharvest research, outreach, and capacity building. Funding strategies include the Immediate Impact Projects already under way, Pilot Proposals to be funded in 2011, and Exploratory Projects, whose application deadline is July 1, 2010. Horticulture CRSP Associate Awards may also be negotiated with USAID Missions in target countries.

### Partner Institutions

Cornell University  
University of Hawaii at Manoa  
North Carolina State University



### Key Horticulture CRSP Issues

Market Systems  
Capacity Building  
Enabling Environment  
Nutrition and Human Health  
Sustainable Production Systems  
Postharvest Systems and Food Safety  
Gender and Horticultural Development

### Horticulture CRSP Objectives

1. Build local scientific & technical capacity
2. Apply research findings and technical knowledge to increase small producers' participation in markets
3. Facilitate the development of policies that improve local horticultural trade and export capacity



### Management Team

Ron Voss, Director  
Beth Mitcham, Associate Director  
Michael Reid, Leader-Innovation & Special Projects  
Mark Bell, Leader-Communication & Info. Transfer  
Heather Kawakami, Budget Analyst  
Sabrina Morgan, Budget Analyst  
Amanda Crump, Program Coordinator  
Diana Puccetti, Office & Event Planning  
Peter Shapland, Graduate Assistant

### Horticulture CRSP Themes

1. Gender equity
2. Innovative technologies
3. Information accessibility

### Immediate Impact Projects

In February, the Horticulture CRSP awarded nearly \$2 million to ten US universities conducting 15 projects in 20 developing countries.



Visit HortCRSP on the web! <http://hortcrsp.ucdavis.edu>





**Horticulture CRSP Immediate Impact Projects Quickly Address Needs in Developing Countries**

Crump, A., Shapland, P.C., Bell, M.A., Voss, R.E., Mitcham, E.J., Reid, M.S.

Horticulture Collaborative Research Support Program, Department of Plant Sciences, University of California-Davis, Davis, CA 95616-5270

**Introduction**

The Horticulture Collaborative Research Support Program (Hort CRSP), funded by USAID, awarded nearly \$2 million to support 15 one-year projects to improve the production and marketing of horticultural crops and products developing countries. The collaborative research effort will be responsible for a broad range of activities demonstrating how horticulture can reduce hunger and malnutrition and raise the incomes of the rural poor.

**Participants**

Ten U.S. universities collaborating with 51 international organizations, agencies and institutions conduct projects in 20 countries.

Developing a concentrated solar drying unit for mango and tomato in Tanzania.



Photo: Diana Barrett

**Countries**

**Africa** – Ghana, Kenya, Nigeria, South Africa, Tanzania, Uganda, and Zambia  
**South and Southeast Asia** – India, Nepal, Sri Lanka, and Thailand  
**Central and South America** – Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, and Panama



Introducing and evaluating appropriate and disease resistant vegetable varieties in Central America as a way to increase family incomes.

Photo: James Nwachuku

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**Information Accessibility**

- Identifying food and plant safety problems in Nigeria and developing a Good Agricultural Practices education system.
- Training bell pepper farmers in current and best management practices to improve production and postharvest quality in Central America.

Expanding nursery facilities, creating demonstration gardens, and developing Farmer Field Schools to promote fruit and vegetable production in Uganda.



Photo: Kate Snow

**Gender Equity & Nutrition**

- Increasing consumer awareness of the nutritional and cultural importance of orange-fleshed Sweetpotato to increase Ghanaian food security and nutrient intake.
- Improving production and use of indigenous vegetables to provide a long-term source of food for economic security and improved nutrition for Kenyans.



Increasing access to fair trade and other markets for Rooibos tea farmers in South Africa.

Photo: Sandra Kruger

**Improved Market Access**

- Exploring potential to export cut flowers from Honduras using existing fruit exporters and improved storage technology.
- Increasing Ghanaian export production of important indigenous spices, medicinal plants and horticultural crops and providing employment and income to farmers.
- Helping Zambian farmers develop market consistent vegetable products for hotels and other tourist industries.



Using solar power and improved cooling to create storage coolrooms (left) and transport where electricity and infrastructure are limited in India, Uganda, and Honduras.

Photo: Michael Reid

**Technology Innovation**

- Improving techniques to dry and store seeds where temperatures and average relative humidity are problematic in India, Nepal, and Thailand.
- Determining the effectiveness of different coatings and essential oils in controlling postharvest disease of mango and papaya and maintaining fruit quality in Sri Lanka.
- Deploying rapid diagnostic tools to detect Phytophthora disease on horticultural crops in Central America.

Up-to-date information on these projects can be found at the interactive Horticulture CRSP website, <http://hortcrsp.ucdavis.edu>.



**Management Team**

The management team at University of California, Davis includes Ron Voss, Emeritus Extension Vegetable Specialist; Beth Mitcham (pictured), Postharvest Extension Specialist; Michael Reid, Postharvest Extension Specialist, and Mark Bell, Director of the International Learning Center.





## Horticulture CRSP Immediate Impact Projects Quickly Address Needs in Developing Countries

Crump, A., Shapland, P.C., Bell, M.A., Voss, R.E., Mitcham, E.J., Reid, M.S.

Horticulture Collaborative Research Support Program, Department of Plant Sciences, University of California Davis, Davis, CA 95616 5270

### Introduction

The Horticulture Collaborative Research Support Program (Hort CRSP), funded by USAID, awarded nearly \$2 million to support 15 one-year projects to improve the production and marketing of horticultural crops and products developing countries. The collaborative research effort will be responsible for a broad range of activities demonstrating how horticulture can reduce hunger and malnutrition and raise the incomes of the rural poor.

### Participants

Ten U.S. universities collaborating with 51 international organizations, agencies and institutions conduct projects in 20 countries.

Developing a concentrated solar drying unit for mango and tomato in Tanzania.



### Countries

Africa – Ghana, Kenya, Nigeria, South Africa, Tanzania, Uganda, and Zambia  
South and Southeast Asia – India, Nepal, Sri Lanka, and Thailand  
Central and South America – Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, and Panama



Introducing and evaluating appropriate and disease resistant vegetable varieties in Central America as a way to increase family incomes.

This project is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under award number: AID-0-06-0000-0000. The contents are the responsibility of the user and do not necessarily reflect the views of USAID or the United States Government. Adapted by American People.

### Information Accessibility

- Identifying food and plant safety problems in Nigeria and developing a Good Agricultural Practices education system.
- Training bell pepper farmers in current and best management practices to improve production and postharvest quality in Central America.

Expanding nursery facilities, creating demonstration gardens, and developing Farmer Field Schools to promote fruit and vegetable production in Uganda.



### Gender Equity & Nutrition

- Increasing consumer awareness of the nutritional and cultural importance of orange-fleshed Sweetpotato to increase Ghanaian food security and nutrient intake.
- Improving production and use of indigenous vegetables to provide a long-term source of food for economic security and improved nutrition for Kenyans.



Increasing access to fair trade and other markets for Rooibos tea farmers in South Africa.

### Improved Market Access

- Exploring export of cut flowers from Honduras using existing fruit exporters and improved storage technology.
- Increasing Ghanaian export production of indigenous spices, medicinal plants and horticultural crops and providing employment and income to farmers.
- Helping Zambian farmers develop market consistent vegetable products for hotels and other tourist industries.



Using solar power and improved cooling to create storage coolrooms (left) and transport where electricity and infrastructure are limited in India, Uganda, and Honduras.

### Technology Innovation

- Improving techniques to dry and store seeds where temperatures and average relative humidity are problematic in India, Nepal, and Thailand.
- Determining the effectiveness of different coatings and essential oils in controlling postharvest disease of mango and papaya and maintaining fruit quality in Sri Lanka.
- Deploying rapid diagnostic tools to detect Phytophthora disease on horticultural crops in Central America.



Up-to-date information on these projects can be found at the interactive Horticulture CRSP website, [www.hortcrsp.ucdavis.edu](http://www.hortcrsp.ucdavis.edu)

### Management Team



## The Role of Horticulture in Alleviating Nutritional Deficiencies in the Developing World

### Nutritional Deficiencies of Children

- Critical 1000 days/ Window of Opportunity
- Good nutrition during this critical period is essential to:
  - Cognitive development
  - Economic and social potential as adults
- Key nutrient issues: Fe, Zn, Vitamin A, Essential Fatty Acids
- Contributions of fruits, vegetables and other horticultural products
  - Green leafy vegetables–Fe, Zn, Vitamin A
    - More Fe and Zn than legumes
  - Tree nuts, Portulaca–Essential fatty acids (Omega 3)
  - Mango, Orange-fleshed sweet potato – Vitamin A
- Food products better accepted and possibly more sustainable than vitamins or pharmaceuticals



### Strategies to Address Nutrient Deficiencies with Horticulture

- Add animals and fruits, tree nuts and vegetables
- Methods of delivering nutrients to infants
  - Via mother's breast milk
  - Directly to infant
  - Both mother and infant
- Processed and fresh forms of fruits and vegetables
  - Green leafy powders to add to infant food
  - Orange sweet potato puree or powders for infants
  - Dried mangoes for year-round supply for mothers and young children
  - Tree nuts for mothers and ground up for infants

### Systems approach to Address Nutrient Deficiencies

- Production of leafy greens, mango, sweet potato, tree nuts, portulaca in combination with animal systems for complete diet diversification
- Link production systems with local processing of improved complementary foods for infants and young children, including lipid-based supplements
- Develop processing industry with woman's groups to increase year-round availability
  - Microfinance
  - Appropriate technologies
    - Concentrated solar drying
    - Powder production and packaging
    - Storage systems for dried products using Zeolite
    - Puree production and packaging
- Education of women
  - Effects of malnutrition
  - Nutritional value of horticulture crop additives
  - Methods of utilization



## The Promise of High Value Horticulture for Poverty Reduction

### Horticulture

Horticulture is the production, postharvest handling and marketing of fruits, vegetables, herbs and spices, and ornamental plants.

### Why Horticulture?

- Poverty is closely linked to hunger and malnutrition
- Production and marketing of high value horticultural crops provides income
- Smallholder farmers can grow significant horticultural yields on their small plot
- Women are the main producers and marketers of horticultural crops in the developing world and achieve income stream for themselves and their children
- Horticultural crops provide for diet diversification and increases availability of Fe, essential fatty acids, Vitamin A and Vitamin C in the diet of the greater community



*When fruit are handled properly,  
significant income can be generated.*

### Priority Strategies for Promoting Horticulture

- Empower local **woman's groups** in horticulture enterprise
  - *Market assessment* - Which crops should we grow? Where can we sell them? What is the market price?
    - ◊ Potential high value crops that are also especially nutritious—tomato, orange-fleshed sweet potato, mango, carrot, leafy greens, green beans
  - Woman's groups working together on production, harvest, packaging, processing, storage, marketing - remove middle men from marketing chain
- Postharvest handling and processing capabilities
  - Develop local capacity for drying and other processing methods
    - ◊ Reduces seasonality of availability and reduces losses
    - ◊ Extends the market season and price control by growers
    - ◊ Microfinance to establish new enterprises to process crop and sell products
  - Develop *microenterprise* for reusable packaging systems, shade structures and other needed tools to reduce losses after harvest
  - Community supported cold storage using local materials and Coolbot refrigeration technology made possible by non-collateral loans to woman's groups by microfinance organizations

Developed by Michael Reid, Adel Kader, Amanda Crump and Beth Mitcham, November 2010

- For Further Information about the value of horticulture development and about the Coolbot, visit our webpage at <http://hortcrsp.ucdavis.edu>





## Feeding the Future – Role of Horticulture CRSP

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USAID's Horticulture Collaborative Research Support Program (Hort CRSP), funded in 2009, and managed by the University of California at Davis, uses the horticulture value chain to improve incomes, nutrition, health, and economic well being for the rural poor, particularly women.

- Empowering women with access to income
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  - *Horticultural crops reduce malnutrition by providing a diverse micronutrient-rich diet.*
- Dissemination of technical assistance
  - *The Hort CRSP harnesses the resources of the US public universities and partner institutions, agencies and organizations in the developing world.*
- Increased agriculture value chain on-and off- farm
  - *Horticultural crops can provide more income and food for farm families from small plots of land.*
- Reducing post-harvest losses of nutritious foods
  - *The Hort CRSP is committed to reducing the 50-80% postharvest loss of perishable food in the developing world.*
- Creating an enabling policy environment for agribusiness growth

Horticulture CRSP has funded 29 projects, with leadership from 15 U.S. universities, working in 34 countries. Projected impacts vary from project to project, country to country, and region to region, but they are all consistent with the issues outlined in the Feed the Future initiative. In West Africa, examples include:

- Economic and nutritional enhancement of traditional diets in Ghana using orange-fleshed sweet potato products.
- Enhancing trade in horticultural crops in Nigeria through food safety and phytosanitary measures.
- Sustainable production of specialty horticultural crops in Ghana for income generation and increased export value.
- Training postharvest specialists from Ghana, Gabon and Benin and enabling them to establish post-harvest service centers.
- Developing low-cost pest exclusion and microclimate modification technologies for small-scale vegetable growers in Benin.

Regional "Centers of Excellence" in 3-5 strategic locations will facilitate training and information exchange for farmers and horticultural professionals.

Horticulture CRSP is prepared to assist in developing regional or country-specific plans or projects to address the Feed the Future initiative, and look forward to the opportunity to work with USAID missions in amplifying the research of our collaborating teams.

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The Hort CRSP is in complete alignment with the FTF key strategies in the areas of:

- Improving agribusinesses productivity, value and competitiveness
- Creating an enabling policy environment for agribusiness growth
- Empowering women with access to income
- Increasing household production of nutritious foods
- Dissemination of technical assistance
- Increased agriculture value chain on-and off- farm.
- Reducing post-harvest losses of nutritious foods

The Hort CRSP harnesses the resources of the US public universities and partner institutions, agencies and organizations in the developing world.

The Horticulture CRSP already has funded 15 Immediate Impact Proposals, with leadership from 10 U.S. universities, working in 20 countries and with the collaboration of 35 in-country organizations. Projected impacts vary from project to project, country to country, and region to region, but they are all consistent with the issues outlined in the Feed the Future initiative. In East Africa, examples include:

- Development and utilization of inexpensive but effective cool rooms and cool transport for scale-scale farmers in **Uganda**.
- Women's market gardens for supplying high-value markets in **Zambia**.
- Concentrated solar drying of mango and tomato in **Tanzania**.
- Promoting fruit and vegetable production to improve nutrition in **Uganda**
- Sustainable production of horticultural crops in **Zambia** for food security, income generation and in support of the tourism industry.
- Indigenous African Leafy Vegetables (ALV) for enhancing livelihood security of smallholder farmers in **Kenya and Tanzania**.

Recently announced "Exploratory" and "Pilot project" awards extend the geographic and subject matter reach of the program. Regional "Centers of Excellence" in 3-5 strategic locations will facilitate training and information exchange for farmers and horticultural professionals.

The Hort CRSP is well positioned to work with the various missions to help identify excellent horticulture investment opportunities to achieve the FTF objectives.

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Horticulture CRSP has funded 29 projects, with leadership from 15 U.S. universities, working in 34 countries. Projected impacts vary from project to project, country to country, and region to region, but they are all consistent with the issues outlined in the Feed the Future initiative. In Eastern and Southern Africa, examples include:

- Development of inexpensive but effective cool rooms for small-scale farmers in **Uganda**.
- Women's market gardens for supplying high-value markets in **Zambia**.
- Concentrated solar drying of mango and tomato in **Tanzania**.
- Promoting fruit and vegetable production to improve nutrition in **Uganda**.
- Sustainable production of horticultural crops in **Zambia** for food security, income generation and in support of the tourism industry.
- Indigenous African Leafy Vegetables (ALV) for enhancing livelihood security of smallholder farmers in **Kenya and Tanzania**.
- Improving market access for emerging **South African Rooibos** farmers.
- Developing low-cost pest exclusion and microclimate modification technologies for small-scale vegetable growers in **Kenya**.
- Establishing a regional postharvest center in **Rwanda**.
- Educating smallholder vegetable farmers in grafting and microclimate management techniques in **Kenya**.
- Transferring GIS skills to Malawians, to identify production and market opportunities in **Malawi**.
- Employing a novel gender-based extension model to more effectively train and engage horticultural farmers in **Kenya**.
- Evaluating the support structure for production and marketing of tomatoes and paprika among small-holders in **Zimbabwe**.

Regional "Centers of Excellence" in 3-5 strategic locations will facilitate training and information exchange for farmers and horticultural professionals.

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In South Asia, examples include:

- New technology for postharvest drying and storage of horticultural seeds in **India and Nepal**.
- Biological-based postharvest quality maintenance and disease control for mango and papaya in **Sri Lanka**.
- Development and utilization of inexpensive but effective cool rooms and cool transport for small-scale farmers in **India**.
- Establishing a South Asia Consortium on Food Safety in **Bangladesh and India** to improve public health, encourage export opportunities and increase smallholder profits.
- Creating a cell-phone enabled extension center in **India, Sri Lanka and Nepal**.
- Strengthening indigenous informal seed systems in **Bangladesh**.

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In Southeast Asia, examples include:

- New technology for postharvest drying and storage of horticultural seeds in **Thailand**.
- Strengthening indigenous informal seed systems in **Thailand, Cambodia, Laos, and Vietnam**.
- Increasing food safety and creating a niche market for smallholders in **Vietnam and Cambodia**.
- Training urban and peri-urban horticultural growers in cropping systems, pre- and postharvest handling and marketing techniques in **Thailand, Cambodia and Vietnam**.
- Improving postharvest technologies and expertise in **Vietnam**

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In South and Southeast Asia, examples include:

- New technology for postharvest drying and storage of horticultural seeds in **India, Nepal and Thailand.**
- Biological-based postharvest quality maintenance and disease control for mango and papaya in **Sri Lanka.**
- Development and utilization of inexpensive but effective cool rooms and cool transport for small-scale farmers in **India.**

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In Central America, examples include:

- Building an ornamental plant industry in Honduras.
- Development and utilization of inexpensive but effective cool rooms and cool transport for small-scale farmers in Honduras.
- Deployment of rapid diagnostic tools for *Phytophthora* on horticultural crops in El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, and Mexico.
- Improving fruit postharvest quality through Best Management Practices and incorporating protective structures in Nicaragua, Haiti, Honduras, Dominican Republic, and Costa Rica.
- Developing agribusinesses to produce and market vegetables and seeds from selected AVRDC tomato and pepper cultivars in Honduras, Nicaragua, El Salvador and Guatemala.
- Improving extension methods for horticultural outreach in Chile, Peru, Bolivia, Ecuador, Honduras and Guatemala.

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## Horticulture CRSP Immediate Impact Projects

**15 projects began on 1 February 2010**

**Africa** - Ghana, Kenya, Nigeria, South Africa, Tanzania, Uganda, Zambia

**South and Southeast Asia** - India, Nepal, Sri Lanka, Thailand

**Central and South America** - Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama

### Project Highlights:

- Expanding the floral export industry in Honduras through improved storage and shipping technology, new breeding programs, trading networks, and grower cooperation.
- Building a viable market structure for production, processing and sale of orange-fleshed sweetpotato in Ghana to increase food security, nutrient intake, and incomes.
- Introducing novel, sustainable technologies to dry and store seeds in hot and humid areas of India, Nepal and Thailand.
- Increasing tomato production, quality and safety through the introduction of a 'Good Agricultural Practices' curriculum in Nigeria.



**Families in the Morazon region of El Salvador are growing vegetables for the first time, marketing the excess, and providing extra income for their families.**

Photo: James Nienhuis



**Because many areas have limited daylength and light intensity, researchers are working with collaborators in Tanzania to use mirrors to create a concentrated solar dryer for tomato and mango.**

Photo: Diane Barrett

- Researching biologically based controls of diseases to maintain postharvest papaya and mango quality in Sri Lanka.
- Integrating emerging or marginalized Rooibos tea farmers into Fair Trade and other market systems in South Africa.
- Using solar power and innovative cooling technology to create storage and transport coolrooms in infrastructure and electricity limited areas of India, Uganda and Honduras.
- Introducing rapid diagnostic tools to detect *Phytophthora* diseases on horticultural crops in El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica, and Mexico.



### Project Highlights (continued)

- Implementing technologies to enhance bell pepper yields and quality, while developing an education and research network for agriculture information exchange in Nicaragua, Haiti, Honduras, Dominican Republic, and Costa Rica.
- Improving community nutrition in Nkokonjeru, Uganda by promoting fruit and vegetable production through local university research and partnerships, demonstration gardens, Farmer Field Schools, and nursery expansion.
- Evaluating locally appropriate disease resistant tomato and chili varieties in El Salvador, Honduras, and Nicaragua and sharing marketing techniques.
- Providing employment and income to farmers by deepening market access and productivity of sustainable specialty crop production in Ghana.



**Improved Farmer Field School curricula and water storage facilities are being used to promote fruit and vegetable production in Uganda.**

Photo: Kate Scow



**Farmers in South Africa are attending workshops to improve marketing of their tea - including how to access Fair Trade and other specialty markets.**

Photo: Sandra Kruger

**Using commonly found materials and novel drying techniques, scientists are working with collaborators in India, Uganda, and Honduras to develop better seed drying and storage for tomato, watermelon, cucumber, onion, and okra.**

Drawing: Kent Bradford



For more information on Horticulture CRSP projects, visit: <http://hortcrsp.ucdavis.edu/main/projects.htm>

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Edited by Amanda Crump and Elana Peach-Fine  
Spring 2011

**Target Countries**  
**Central and South America:**  
Costa Rica, Dominican Republic,  
El Salvador, Guatemala, Haiti  
Honduras, Mexico, Nicaragua,  
Panama  
**Africa:**  
Ghana, Kenya, Nigeria, South Africa,  
Tanzania, Uganda, Zambia  
**South and Southeast Asia:**  
India, Nepal, Sri Lanka, Thailand

Online at <http://hortcrsp.ucdavis.edu>:

- Interactive Map
- Summaries of Each Project
- List of In-Country Collaborators



**Project Themes**

- Enabling Environment
- Food Safety
- Germplasm
- Nutrition
- Postharvest
- Sustainable Production

**Contact Us:**

**On the Internet:**  
<http://hortcrsp.ucdavis.edu>

**Mailing Address:**  
Horticulture CRSP  
Department of Plant Sciences  
University of California  
One Shields Avenue (190 EH)  
Davis, CA 95616-5270  
TEL: (530) 752-3522  
FAX: (530) 752-7182  
E-mail: [hortcrsp@ucdavis.edu](mailto:hortcrsp@ucdavis.edu)

**Package Delivery:**  
Horticulture CRSP  
Department of Plant Sciences  
190 EH Building  
University of California  
190 Environmental Horticulture  
Davis, CA 95616-5270



Horticulture Collaborative  
Research Support  
Program (CRSP)

Immediate Impact  
Projects



<http://hortcrsp.ucdavis.edu/main/projects.htm>

## Immediate Impact Projects

PI	University	Target Country	Title
Barrett, Diane	University of California, Davis	Tanzania	Concentrated Solar Drying of Mango and Tomato
Bennett, Alan	University of California, Davis	Honduras	Building an Ornamental Plant Industry in Honduras
Bonsi, Eunice	Tuskegee University	Ghana	Concentrated Nutritional and Economic Enhancement of Ghanaian Traditional Diets, Using Orange-Fleshed Sweetpotato Products
Bradford, Kent	University of California, Davis	India, Nepal, Thailand	New Technology for Postharvest Drying and Storage of Horticultural Seeds
Miller, Sally	The Ohio State University	Nigeria	Enhancing Trade in Horticultural Crops through Food Safety and Phytosanitary Measures
Nienhuis, James	University of Wisconsin-Madison	El Salvador, Honduras, Nicaragua	Sustainable Production and Marketing of Vegetables in Central America
Paull, Robert	University of Hawaii at Manoa	Sri Lanka	Biological-Based Postharvest Quality Maintenance and Disease Control for Mango and Papaya
Raynolds, Laura	Colorado State University	South Africa	Improving Market Access for Emerging South African Rooibos Farmers
Reid, Michael	University of California, Davis	India, Uganda, Honduras	Coolrooms and Cool Transport for Small-Scale Farmers
Ristaino, Jean	North Carolina State University	El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Mexico	Deployment of Rapid Diagnostic Tools for <i>Phytophthora</i> on Horticultural Crops in Central America
Santos, Bielinski	University of Florida	Nicaragua, Haiti, Honduras, Dominican Republic, Costa Rica	Improving Fruit Postharvest Quality through Best Management Practices for Perishable Vegetable Production in Protective Structures
Scow, Kate	University of California, Davis	Uganda	Promoting Fruit and Vegetable Production to Improve Nutrition in Nkokonjeru, Uganda
Simon, James	Rutgers University	Ghana	Sustainable Production of Specialty Horticultural Crops in Ghana for Income Generation and Increased Export Value
Simon, James	Rutgers University	Zambia	Sustainable Development of Horticultural Crops in Zambia for Food Security, Income Generation and in Support of the Tourism Industry
Weller, Stephen	Purdue University	Kenya, Tanzania	Indigenous African Leafy Vegetables (ALV) for Enhancing Livelihood Security of Smallholder Farmers in Kenya

**Goals:**

- Reduce poverty and improve the nutrition and health of the rural poor in developing countries
- Improve the sustainability and profitability of horticulture in the developing world

**Management Team (UC Davis):**

Ron Voss, Director  
Beth Mitcham, Associate Director  
Michael Reid, Leader, Innovative Technology and Special Projects  
Mark Bell, Leader, Communication and Information Transfer  
Heather Kawakami, Budget Analyst  
Amanda Crump, Program Coordinator  
Diana Puccetti, Office Assistant  
Peter Shapland, Graduate Assistant



**Contact Us:**

On the Internet:  
<http://hortcrsp.ucdavis.edu>

Mailing Address:  
Horticulture CRSP  
Department of Plant Sciences  
University of California  
One Shields Avenue (190 EH)  
Davis, CA 95616-5270  
TEL: (530) 752-3522  
FAX: (530) 752-7182  
E-mail: [hortcrsp@ucdavis.edu](mailto:hortcrsp@ucdavis.edu)


Package Delivery:  
Horticulture CRSP  
Department of Plant Sciences  
University of California  
190 Environmental Horticulture  
Davis, CA 95616-5270

**Partner Institutions and Contacts:**

Cornell University, KV Raman  
University of Hawaii, Robert Paull  
North Carolina State University, George Wilson



**Horticulture Collaborative  
Research Support  
Program (CRSP)**

 a long term commitment by USAID to address poverty and hunger of the rural poor in developing countries



<http://hortcrsp.ucdavis.edu>

*Reducing poverty, improving nutrition and health, and improving sustainability and profitability through horticulture.*



### Objectives:

The Hort CRSP-with the support of USAID-provides funding to

- realize the opportunities of *horticultural development*
- improve *food security*
- improve *nutrition and human health*
- provide opportunities for *diversification of income*
- advance *economic and social condition of the rural poor, particularly women*



Facilitate the development of policies that improve local horticultural trade and export capacity.

### Themes:

- Information Accessibility
- Technology Innovation
- Gender Equity

Build local scientific and technical capacity.



### Outputs:

- Improved national capacity of developing countries to support the poor through enhanced horticultural systems
- Improved food security, nutrition and human health
- Improved and diversified incomes of the poor.

### Priority Issues:

- Sustainable Crop Production
- Postharvest Technology
- Food Safety
- Market Access
- Financing



Apply research findings and technical knowledge to increase small producers' participation in markets.

### Target Regions:

- Sub-Saharan Africa
- Latin America
- South and South-East Asia

APPENDIX VI. HORTICULTURE CRSP USAID INDICATORS.

<b>4.5.1 Agriculture Enabling Environment</b>	<b>FY 2010 Targets</b>	<b>FY 2010 Results</b>
Number of policies/regulations/administrative procedures analyzed as a result of USG assistance.	4	4
Number of policy reforms/regulations/administrative procedures presented for legislation/decreed as a result of USG assistance.	1	1
Number of policy reforms/regulations/administrative procedures passed for which implementation has begun with USG assistance.	1	1
Number of individuals who have received USG supported short-term agricultural enabling environment training - Female	5	3
Number of individuals who have received USG supported short-term agricultural enabling environment training - Male	5	3
Number of individuals who have received USG supported long-term agricultural enabling environment training - Female	0	0
Number of individuals who have received USG supported long-term agricultural enabling environment training - Male	0	0
<b>4.5.2 Agriculture Sector Productivity</b>	<b>FY 2010 Targets</b>	<b>FY 2010 Results</b>
Number of new technologies or management practices under research as a result of USG assistance.	100	241
Number of new technologies or management practices made available for transfer as a result of USG assistance.	85	262
Number of new technologies or management practices being field tested as a result of USG assistance.	80	246
Number of additional hectares under improved technologies or management practices as a result of USG assistance.	150	93
Number of rural households benefiting directly from USG interventions	2,000	1,418
Number of producers organizations, water users associations, trade and business associations, and community-based organizations (CBOs) receiving USG assistance	250	253
Number of agriculture-related firms benefiting directly from USG supported interventions.	125	172
Number of women's organizations/associations assisted as a result of USG interventions.	50	47
Number of public-private partnerships formed as a result of USG assistance.	50	50
Number of individuals who have received USG supported short-term agricultural sector productivity training - Female	1,700	1,255
Number of individuals who have received USG supported short-term agricultural sector productivity training - Male	1,300	1,032
Number of individuals who have received USG supported long-term agricultural sector productivity training - Female	5	4
Number of individuals who have received USG supported long-term agricultural sector productivity training - Male	5	4

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