

Horticulture CRSP News



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

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In Focus: Horticulture CRSP Videos

As Horticulture CRSP moves on to a new set of projects this fall, we are eager to share some of our projects that are now coming to an end. A variety of success stories have already been presented through our newsletters and website. We hope you have enjoyed reading about these projects, but we think that you will enjoy seeing them even more! With our new videos you will be transported into the on-the-ground work Horticulture CRSP teams are doing in countries across the globe. These videos give a good general overview and vibrantly present the projects through pictures and music.

Seven different projects currently have videos on our Horticulture CRSP YouTube[®] station. For Example:

- *Phytophthora* Training: Introducing rapid diagnostic tools to detect diseases on horticultural crops in El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica, and Mexico.
- Farmer-Led Research: Improving community nutrition in Nkokonjeru, Uganda by promoting fruit and vegetable production through local university research and partnerships, demonstration gardens, participatory evaluation, and nursery expansion.
- African Leafy Vegetables: Establishing long-term improved nutrition and economic security by increasing production and use of indigenous vegetables in Kenya.

We hope this video format will make our projects more accessible and we are excited to add them to our portfolio. We'll be adding the rest of the projects to our video portfolio this year.

To see our videos or subscribe to our YouTube[®] channel please go to:
<http://www.youtube.com/user/hortcrsp>

---HortCRSP editorial staff: Mark Bell, Amanda Crump, Peter Shapland, & Elana Peach-Fine

Videos on the HortCRSP YouTube® Channel



Introducing rapid diagnostic tools to detect Phytophthora diseases on horticultural crops in El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica, and Mexico.

Lead Investigator - Jean Beagle Ristaino, North Carolina State University



Using solar power and innovative cooling technology to tackle postharvest issues in India, Uganda and Honduras.

Lead Investigator - Michael Reid, University of California, Davis



Introducing novel, sustainable technologies to dry and store seeds in hot and humid areas of India, Nepal and Thailand.

Lead Investigator - Kent Bradford, University of California, Davis



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.

Lead Investigator - Kate Scow, University of California, Davis



Building a viable market structure for production, processing and sale of orange-fleshed sweetpotatoes in Ghana to increase food security, nutrient intake, and incomes.

Lead Investigator - Eunice Bonsi, Tuskegee University



Developing a concentrated solar drying unit for mango and tomato in Tanzania to improve off-season food security.

Lead Investigator - Diane Barrett, University of California, Davis



Establishing long-term improved nutrition and economic security by increasing production and use of indigenous vegetables in Kenya.

Lead Investigator - Stephen Weller, Purdue University

Early Diagnostic Tools for *Phytophthora* in Latin America

Phytophthora, Greek for plant-destroyer, is a ubiquitous plant parasite that robs the world's farmers of billions of dollars each year. This soil-inhabiting parasite, more closely related to brown algae than true fungi, travels the dank, dirty corners of Earth's underbelly using numerous aliases along the way, such as: root rot, sudden oak death, and late blight of potato. The last of these was responsible for the Irish potato famine in the 1850's, which caused the death or displacement of over two-million people. Other species of *Phytophthora* cause major losses to tomato, soybean, pepper, ornamental and forest tree species.

Trained agricultural professionals can now communicate disease incidence or diagnostic questions through the foundation of the Latin American *Phytophthora* Diagnostic Network (LAPDN).

Growers and plant pathologists in the United States control the spread of *Phytophthora* through early identification. They use a variety of

diagnostic tools, which enable them to act before the disease damages their entire field. However, farmers in the developing world have fewer resources to protect their horticultural crops from *Phytophthora*. To make matters worse, *Phytophthora* thrives in moist environments that prevail in the humid tropics of the developing world.

In order to address the problem of controlling *Phytophthora* in developing countries, Horticulture CRSP partnered with North Carolina State University to arm Central American agricultural support systems with diagnostic capabilities. Horticulture CRSP researchers have trained extension agents, university scientists and NGOs throughout Central America to diagnose *Phytophthora*. The rapid and inexpensive diagnostic tools consist of the use of morphological characteristics, molecular tools and a computerized key developed at North Carolina State University to identify the different species of *Phytophthora*. The key is available from APSpress (<http://www.apsnet.org/apsstore/shopapspress/Pages/default.aspx>).

Equally important to diagnosis in the control of disease spread is communication. Trained agricultural

professionals can now communicate disease incidence or diagnostic questions through the foundation of the Latin American *Phytophthora* Diagnostic Network (LAPDN). This resource is a network of plant diagnostic clinics in Central America. Defense efforts can now be coordinated across national borders and clinics can work together to avoid exporting infected crops to countries in North America and the rest of the world. LAPDN will also serve as platform for *Phytophthora* incidence surveys, which has allowed scientists to identify trends of *Phytophthora* occurrence on cacao, potato and root and floriculture crops throughout Central America. This may allow for planning and prevention of future outbreaks.

Early identification is the key to managing *Phytophthora*. Horticulture CRSP researchers are helping Central American farmers identify *Phytophthora* quickly and cheaply by building local scientific and technical capacity within their agricultural support system. Central Americans from government regulatory agencies, private companies and public and private universities are employing state-of-the-art diagnostic technologies and building a scientific network in order to help rural farmers manage this plant pathogen.

To see the Horticulture CRSP video about this project please visit: http://youtu.be/KayQWtqf_Sw



Agricultural professionals learn to diagnose *Phytophthora*.

Farmer-Led Research and Capacity-Building for Improved Extension in Uganda

The Ugandan village of Nkokonjeru is nestled in a unique moist, deciduous forest ecosystem near Lake Victoria and the birthplace of the Nile River. This hill town, however, is no exception to the problems that plague the country of Uganda. Even as overall poverty levels in this country fall, nearly 1 in 4 children are underweight for their age and an estimated 19% of all people in Uganda are undernourished (World Food Programme 2009). In Nkokonjeru, most residents have few, if any, external income sources and obtain the majority of their calories from *matooke* (plantains) grown on small plots around their homes. Despite the urgent need to diversify diets, fruit and vegetable consumption is limited, both by the varieties available and high prices.

In order to expand the availability and consumption of horticultural crops, Horticulture CRSP supported a team of U.S. and Ugandan researchers to help farmers of Nkokonjeru build knowledge and production capacity to improve their nutrition and livelihoods. The international team of students and professors used a comprehensive approach based on training and capacity building in order to assure the sustainability of their results. Their multifaceted method took advantage of political changes and the continuous collaboration and involvement of several other organizations.

In 2001, the Ugandan government restructured their national agricultural extension systems to incentivize farmers to form cooperatives and effective farmer groups. As a result of this legislation, the Nkokonjeru Parish Church association and the Rural Agency for Sustainable Development organized over 100 families into 10 farmer groups. Despite this effort, agriculture extension in the region was still inadequate. In response to this slow progress Horticulture CRSP researchers teamed up with the Rural Agency for Sustainable Development to strengthen extension efforts in the region, work with existing farmer groups and create new ones. This project was designed to move beyond the traditional focus on coffee and *matooke* (cash crops, which traditionally favor male involvement) to fruits and vegetables, which directly

benefit the woman and children that cultivate these crops.

The team improved the local extension system in Nkokonjeru through a number of specific activities. The project worked to expand the local nursery to serve as an information center for fruit and vegetable production information while increasing the availability and diversity of high quality vegetable and fruit tree seeds, seedlings, and cuttings at the nursery. Interactive seminars were conducted regularly in Nkokonjeru and a curriculum and materials were put together for a participatory learning program that drew from the 'Farmer Field School' approach. This program involved variety trails, simple field experiments, regular field observations and collective analyses performed by the farmer groups. Through this process, the farmers themselves could make decisions about crops and suggested best management practices. During the

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Farmer groups in Nkokonjeru work together to evaluate planting techniques.

Partner Profile: Stephen Weller

Throughout his 31 years as a professor of horticulture at Purdue University, Stephen Weller has been involved in a variety of international development projects. His interest and work in this field grew significantly in the early 1990's when he became involved with the IPM (Integrated Pest Management) CRSP project that focused on vegetable crops in Central America. In recent years, he has also done international work in pest management, weed science and crop production in the Middle East, Kenya and China.

Dr. Weller's project with Horticulture CRSP, "*Indigenous African Leafy Vegetables for enhancing livelihood security of smallholder farmers in Kenya*" was borne out of a partnership between Purdue University and AMPATH (Academic Model Providing Access to Healthcare), a cooperative university-based Kenyan organization headed by Indiana University School of Medicine and Moi University School of Medicine in Eldoret, that works on a comprehensive approach to the HIV/AIDS epidemic in Kenya. Through one of AMPATH's main programs, distributing retro antiviral medicines to HIV positive people, AMPATH researchers showed that if their patients did not have access to sufficient and healthy diets, the medicines were not as effective in overcoming the debilitating effects of the disease and the patient's overall health was still marginal. Because a majority of AMPATH's patients are

farmers, the organization, through their agriculture outreach group, the Family Preservation Initiative (FPI), teamed with Dr. Weller and Purdue University to develop a research agenda to supplement their overall agriculture outreach program. Dr. Weller speaks with pride about the importance of the FPI programs to HIV-positive farmers. "When the farmers get sick," he says, "they spend all their money on healthcare; they might leave the farm or get ostracized from the community. When they get well again, their home community isn't really sure they want them back. There is a lot of stigma for this disease so we were helping the patients to get reoriented within agriculture and the community."

When Horticulture CRSP's first call for proposals was released in 2009, Dr. Weller and his collaborators (AMPATH, Moi University, KARI (Kenyan Agriculture Research Institute), AVRDC-The World Vegetable Center, Michigan State University and Tennessee State University) developed a proposal that capitalized upon the connections and momentum they had already built with AMPATH and Kenyan farmers. Their collaborative project consisted of improving rural livelihoods through the investigation and promotion of new germplasm of several nutritiously rich indigenous African vegetables. An untrained eye would likely identify these leafy greens as common garden weeds, but amaranth, spider plant and African nightshade are very much a part of

the ethnic diets of rural Kenyans. The majority of rural people growing these vegetables, however, had access to a limited number of local varieties, which were not necessarily of the highest quality. To improve the quality, researchers established demonstration plots with a wide range of improved varieties in Western Kenya at KARI and



Stephen Weller poses for a picture with one of the project's farmer groups in Western Kenya.

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Farmer-Led Research continued from Page 4

program innovative technologies, such as applying fertilizer in microdoses to kickstart soil fertility, combining organic and inorganic nutrient sources and pumping water to a water tank for irrigation, were introduced. Through this program participants also learned business skills for farming such as record keeping and marketing. Outreach training was also provided to Uganda Christian University students to enhance institutional capacity in agriculture and research and education exchange with U.S. universities. Finally, the project team worked to build the capacity of the Rural Agency for Sustainable Development, a constant presence in Nkokonjeru, to support farmers through improved communication and institutional organization.

This project was made up by numerous different threads of research and activities, but throughout its year-long life span, the threads were woven together to make an immediate impact on the farmer groups of the Nkokonjeru region. This was done by providing technical training in fruit and vegetable management and improving farmers' access to simple and innovative production technologies. More importantly these changes have a higher likelihood of being sustained due to the project's focus on building strong connections among farmers in their groups as well as constructive interaction between different groups, improved capacities of local university students to work with these farmers, and facilitated communication between the Rural Agency for Sustainable Development and farmer groups.

To see the video about this project, please visit <http://www.youtube.com/user/hortcrsp> and click on Farmer-Led Research.

¹World Food Programme. 2009. Accessed 12 December 2009. <http://www.wfp.org/countries/uganda>

Horticulture CRSP Holds Spring Meeting

On April 19th and 20th Horticulture CRSP hosted 65 project collaborators and international partners at our spring meeting here at University of California, Davis. Some invitees traveled for three days to share their projects and experiences during this first year of Horticulture CRSP.

Horticulture CRSP's first funding cycle financed 15 different Immediate Impact projects in 21 countries. These projects aimed to improve post-harvest technologies, production systems, marketing strategies, pest management and nutrition. During the first day of the conference, each of the Immediate Impact Projects presented their lessons learned throughout the year. They focused on the technology and scalability of their projects, modes of delivery and the particular cultural or political considerations of project implementation. Time was allocated so that each project was able to receive constructive feedback from their colleagues.

The second day of the conference focused on the future of Horticultural CRSP and how to scale up technologies implemented in both the Immediate Impact projects and the newer Exploratory and Pilot projects. In a breakout session, smaller groups discussed how scale up projects successful in one village to 200,000 villages. In the afternoon, Horticulture CRSP received advice from conference participants about how to formulate the next call for proposals in order to have the greatest global impact.

During the third day, participants were taken to visit the Horticultural CRSP technologies on campus. They also toured the Russell Ranch Sustainable Agricultural Facility, Full Belly organic farm in the Capay Valley, and the Davis Farmer's Market.

We are grateful to the all of the conference participants for their contributions and their company. We hope that all participants felt welcomed and comfortable during their stay. We anticipate that the Thailand conference in 2012 will be equally successful!

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Moi University and worked with farmers to identify local varietal preferences. The most favorably reviewed varieties were distributed to the participating farmers for further evaluation for performance. The farmers were also trained in basic production practices including seeding practices, bed formation, seed saving and storage and rainy-season cultivation techniques.

“...the credit really goes to the Kenyans, they did a great job being there day to day and making things happen.”

Of the approximately 285 participating farmers, over 80% now cultivate indigenous vegetables. “The satisfaction level has been tremendous!” stated Dr. Weller. Follow-up surveys have shown that people prefer the taste and the larger leaves of the new varieties that were identified over the course of the project. Many smallholder farmers have found that family and community members will come to their farms to purchase

their indigenous vegetables directly. Some farmers have even begun to sell their excess produce in the markets. Dr. Weller recounts one such success story, “We were at one farm east of Eldoret and an HIV-positive female farmer said when she came back to the community, nobody wanted anything to do with her. Then they started seeing her growing these indigenous vegetables quite successfully. After a while they started coming to her farm and buying vegetables. Now she actually employs two people from the community on her farm. People have gained new respect for her.”

Dr. Weller attributes the success of the project to the strength of the relationship that Purdue and AMPATH had from the start, and to the new relationships that were built along the way. “I can take some credit,” said Dr. Weller, “but the credit really goes to the Kenyans, they did a great job being there day to day and making things happen.”

In the future Dr. Weller hopes to expand the project to reach more farmers. As part of this expansion, he would like to conduct more research on African indigenous vegetable germplasm, pest pressures, production practices and new recipes to further incorporate these vegetables into local diets and improve post-harvest handling and access to markets. He also believes that participating farmers could benefit from more training in seed collection and storage practice. More than expanding the project, however, Dr. Weller’s primary priority is finding additional support in order to continue working with the Kenyan farmers for several more years to institutionalize the new practices that have been introduced. “In a situation where you come in for a limited period of time, you create a lot of excitement, you create a lot of hope, but you also have to create a support system to make it happen and allow sustainability of the introduced enterprises” says Dr. Weller, “if you ingrain new thinking over a few years and show farmers the improvements work in generating food security and income generation, it is much more likely that people will keep using these new technologies in the long term.”

To see a video about Stephen Weller’s project please go to: http://youtu.be/5f_1p6AmMKk

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

Malnutrition: The Largest Threat to Global Health

- Over 900 million people in the world are undernourished
- Malnutrition responsible for 3.5 million deaths each year
- Malnutrition suppresses the immune system and contributes to half of all childhood deaths
- 250,000 to 500,000 children lose their sight every year due to Vitamin A deficiency
- Over half the world's population suffers from iron deficiency, which reduces their productivity and school performance.
- Vitamin C deficiency compromises immunity and results in poor wound healing.



Fruits and vegetables in a variety of colors provide essential nutrients.

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

Fruits and Vegetables: The Simple Solution

- Fruits and vegetables improve nutrient absorption in a diet high in phytate (whole grains, seeds, pulses)
- Green leafy vegetables—Fe, Vitamin A
 - More available Fe than legumes
- Tree nuts, Portulaca—Essential fatty acids (Omega 3)
- Mango, Pumpkin, Carrot, Orange-fleshed sweet potato – Vitamin A, Vitamin C
1/2 cup pumpkin, 2/3 a carrot, 1 mango supplies RDA of Vitamin A and Vitamin C
- Citrus, guava, broccoli, peppers, potato—Vitamin C
- Food products better accepted and possibly more sustainable than vitamin supplements or pharmaceuticals for some populations

Developed by Kay Dewey, Mark Bell, Peter Shapland,
Amanda Crump, Michael Reid and Beth Mitcham

Strategies to Address Nutrient Deficiencies in the Diet with Horticulture

- Incorporate fruit, tree nuts and vegetables into diet, along with animal products
- Methods of delivering nutrients to infants
 - Via mother’s breast milk (feed to the mother)
 - Directly to infant
 - To both mother and infant
- Processed and fresh forms of fruits and vegetables increase access, reduces postharvest losses and provide year-round availability
 - Green leafy powders to add to infant food
 - Orange sweet potato or carrot 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, carrots, tree nuts, and portulaca for diet diversification in combination with animal products
- Link production systems with local processing of improved complementary foods for infants and young children, including lipid-based supplements
- Develop a 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 (drying material)
 - ◊ Puree production and packaging
- Education of women
 - Effects of malnutrition
 - Nutritional value of horticulture crop additives
 - Methods of utilization
 - Methods of storage/processing



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Healthy food choices to reduce malnutrition.

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