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**HORTICULTURE
INNOVATION LAB**

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Horticulture: Key Opportunities for Nutrition Washington, D.C., July 9, 2014¹

Overview

The Feed the Future Innovation Lab for Collaborative Research on Horticulture (Horticulture Innovation Lab) held a forum “Horticulture: Key Opportunities for Nutrition” at the Association of Public and Land-grant Universities headquarters in Washington, D.C. on July 9 to provide stakeholders with an introduction to Horticulture Innovation Lab’s projects and gather input on knowledge gaps in the field on which new research is still needed. The event was attended by over 30 development practitioners, USAID staff, and researchers.

Since its inception in 2009, the Horticulture Innovation Lab has funded 38 collaborative research projects in 30 countries, 14 of which are current Feed the Future countries. This is an exciting time for horticultural crops, because they are high value and nutritious; however too few people eat the daily recommended amount, often due to lack of access. The Horticulture Innovation Lab does research that takes into account the entire value chain and social aspects including gender issues. It is committed to promoting a diet rich in vegetables, gender equality, and a better life for those most in need, while at the same time building capacity in students and institutions. Through collaborative research with U.S. and host country partners, it is addressing its research goals by improving the production of fruits and vegetables and increasing availability of horticultural crops. The Horticulture Innovation Lab has also worked on food safety and several projects focusing on marketing.

Two of the Horticulture Innovation Lab’s most successful nutrition-focused projects were featured during the forum. The first focuses on the production and marketing of African indigenous vegetables in Kenya, Tanzania, and Zambia presented by Dr. Stephen Weller (Principal Investigator, Purdue University) and the second is strengthening the orange- and purple-fleshed sweet potato value chain in Ghana, presented by Dr. Desmond Mortley (Co-Principal Investigator, Tuskegee University). In addition, Dr. Jeffrey Griffiths, Director, Feed the Future Innovation Lab for Collaborative Research on Nutrition-Africa at Tufts University and Dr. Rolf Klemm, Principal Investigator, Nutrition Innovation Lab-Asia (Johns Hopkins University and Helen Keller International) each spoke on topics related to the intersection of agriculture, health, and nutrition. The forum also drew on the expertise of attendees through a facilitated discussion on best practices and challenges to increase the production, marketability, and consumption of nutrient-rich horticultural crops. The session closed with a presentation from Mike Manske (Nutrition Advisor, USAID) about USAID’s new Multi-sectoral Nutrition Strategy 2014-2025.

The projects presented by the Horticulture, Nutrition-Africa, and Nutrition-Asia Innovation Labs are integrating nutrition into agricultural research, aligning with USAID’s new Multi-Sectoral Nutrition Strategy to promote nutrition-sensitive agriculture. The research analyzes smallholders’ agricultural practices and socio-cultural contexts to identify pathways to increase production and

¹ This summary was prepared by Cultural Practice, LLC (CP) in collaboration with Feed the Future Innovation Lab for Collaborative Research on Horticulture.

consumption of horticultural crops. It emphasizes that the increased production, sale, and integration of nutrient-rich fruits and vegetables into smallholders' diets can provide them with new economic opportunities and improve their nutritional status.

A summary of the highlights of each session are presented below. The presentations themselves are available at the workshop website: http://horticulture.ucdavis.edu/main/events/dc_nutrition/.

More about horticulture and nutrition can be found at:

http://horticulture.ucdavis.edu/main/media%20page/how_horticulture_improves_nutrition.pdf.

Horticulture Innovation Lab Research on African Indigenous Vegetables

Presenter: Dr. Stephen Weller, Purdue University

The Horticulture Innovation Lab project “Sustainable African Indigenous Vegetable Production and Market-chain Development for Improved Health and Nutrition and Income Generation by Smallholders” (2011- 2014) focuses on strengthening the African indigenous vegetable (AIV) industry. It uses a market-first approach to overcome constraints along the value chain, improve production practices, supply, postharvest handling, distribution, and consumer acceptance of AIVs in Kenya, Tanzania and Zambia. Gender differences in knowledge about AIVs and engagement in the AIV value chain is a significant theme in the research. Dr. Jim Simon of Rutgers University, recipient of the 2012 BIFAD Award for Scientific Excellence, is also a researcher on the project investigating the nutritional composition of AIVs and participated in the forum.

African indigenous vegetables are a mainstay in people's diets in East Africa, are often grown for home consumption, and have a huge market potential. These crops, including African Nightshade, Amaranthus, and Spider plant, also help to diversify diets and provide essential nutrients. This project's four main objectives include: (1) evaluate the status of growers along the AIV value chain; (2) assess the agronomic potential of AIVs; (3) evaluate AIV preservation techniques that enhance micro-nutrient composition and retention; and (4) build capacity in the AIV market chain. Led by Purdue University, project collaborators include Rutgers University (U.S.); USAID/AMPATH Project, University of Eldoret (Kenya); AVRDC-The World Vegetable Center, Sokoine University and St. John's University (Tanzania), and the Agribusiness in Sustainable Natural African Plant Products (ASNAPP) (Zambia). The project also collaborates with farmers in Kenya associated with the USAID-KHCP Fintrac-led project by introducing AIVs and training the growers on agronomic practices, postharvest, seed saving and market connections.

The research conducted a baseline household survey and a market survey to collect basic demographic data, and information about current knowledge and challenges of AIV production, post-harvest handling, household consumption, preparation methods, and market access. A consumer survey was then conducted on men's and women's preferences for AIV produce. Focus groups held in Busia, Kenya explored men's and women's farmers' constraints in AIV production and marketing. To assess the agronomic potential of AIVs researchers evaluated AIV germplasm, nutrient composition of AIV leaves, best harvest and postharvest storage practices, and determined the best harvest and processing techniques for AIV seed yield, quality, and

storage. The project also developed techniques to add value to dried AIVs including using solar dryers and postharvest storage technologies including the Shadebot, [CoolBot](#), and an evaporative cooling technique. Farmers were trained on AIV production and harvesting techniques, as well as seed collection, processing, and storage.

The project has identified key constraints and opportunities for strengthening the AIV value chain. The project found that women provide most of the labor to produce AIVs. The household, market, and consumer surveys and focus groups helped the team to identify key AIV production and marketing constraints including high-priced and limited availability of inputs, drought, pests, low-soil fertility, poor postharvest handling and seed preservation, and consumer taste preferences that deterred them from purchasing and consuming AIVs. Researchers found that most AIVs were consumed by farmers' own households and that many maize farmers were unaware of the commercial value of AIVs. There were also regional differences in consumers' preference for particular AIVs. Taste testing events were held to enhance farmers' knowledge of the nutritional content of AIVs and to learn their reactions to new recipes. The project has trained over 1,700 men and women farmers through participatory research and outreach activities.

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Following the presentation, Stephen Weller commented on the gender dimensions of AIV production and issues around the perception of AIVs that can limit their purchase and consumption. Women farmers are primarily responsible for the labor involved in the production of AIVs. Weller noted that project is using labor-saving approaches to reduce the effort required by women farmers.

The full presentation is available here:

http://horticulture.ucdavis.edu/main/events/dc_nutrition/weller.pdf

A recent story about this project was featured in the Feed the Future newsletter:

<http://feedthefuture.gov/article/growing-evidence-base-behind-nutritious-leafy-vegetables>

Research on Orange- and Purple-fleshed Sweet Potatoes

Presenter: Dr. Desmond Mortley, Tuskegee University

The “Sustainable Technology for Orange and Purple Sweet potato (STOPS) in Ghana” (2011-2014) project uses nutrition-based education to introduce new technologies in the sweet potato value chain. This project worked in three sweet potato growing resource-poor regions in Ghana to improve food security, agricultural productivity, economic opportunities, and nutrition. Collaborators under this Tuskegee University-led project included Pennsylvania State University (U.S.); University of Ghana, Food Research Institute, Crop Research Institute, Savanna Agricultural Institute, Selasie Farms and Groceries, the Hunger Alliance of Ghana (HAG) and the Ministry of Food and Agriculture (Ghana).

Activities focused on improving farmers' agricultural practices and adding value to their sweet potato products. Activities included an analysis of the nutritional value of four varieties of orange- and purple-fleshed sweet potatoes, the distribution of sweet potato vines to grower-multipliers, and improving bed, grading, and storage practices to increase yields. Researchers engaged with communities to share new methods for adding value to sweet potato products including producing chips through solar drying, making flour from sweet potatoes to produce golden Sika bread, and developing new products like weaning food. Additionally, women were targeted under this project in the processing of nutrient-rich sweet potato, reformulating recipes for home consumption, and developing new sweet potato products. This Horticulture Innovation Lab project works with Selasie Farms and Groceries, a woman-owned processing firm, to manufacture some of these products. Selasie Farms has also been a recipient of business development services provided USAID Farmer to Farmer volunteer program. The project also engaged with youth through two schools and a children's village, introducing them to new practices.

The "Sustainable Technology for Orange and Purple Sweet potato (STOPS)" in Ghana has identified pathways to increase the production and consumption of orange- and purple-fleshed sweet potatoes in three resource-poor regions of Ghana. The project established clean vine production, maintenance, and distribution channels. It also increased bakers' interest in using orange sweet potatoes in their bread recipes, increasing demand for local production.

The full presentation is available here:

http://horticulture.ucdavis.edu/main/events/dc_nutrition/mortley.pdf

Nutrition Innovation Lab Research on Horticulture, Food Security, and Nutrition

Fruit & Vegetable Production in Uganda: Greater Fruit and Vegetable Consumption, Improved Food Security, Less Anemia

Presenter: Dr. Jeffrey Griffiths, Tufts University

The Feed the Future Innovation Lab for Collaborative Research on Nutrition-Africa's (2010-2015) is researching the intersections of horticulture, food security, and nutrition in Ghana by examining how greater consumption of fruits and vegetables is linked to food security and the prevalence of anemia, the most common nutritional deficiency globally. The Nutrition Innovation Lab-Africa partners with USAID/Uganda, Makerere University and the National Planning Authority of Uganda, and the USAID Uganda Community Connector Project implemented by FHI360.

The Innovation Lab conducted a household survey to investigate whether the consumption of fruits and vegetables improves people's health and household food security. Data from the baseline survey helps to track the effectiveness of the USAID/Uganda Community Connector Project. The survey sample included 3,630 households in 6 districts in Uganda using over 2,700 variables to enumerate agricultural livelihood, food security, nutritional, health, and gender outcomes in vulnerable households and population. Data was collected on crop enterprises,

women's food intake diversity patterns, household socioeconomics, anthropometry, and blood sample testing for anemia and malaria.

Through this household survey the Nutrition Innovation Lab found that i) fruit and vegetable production significantly increases fruit and vegetable consumption and ii) fruit and vegetable producers had less food insecurity than non-producers. This gap in food insecurity between producers of fruits and vegetables and non-producers was most significant among the severely food-insecure group compared to the food secure, mild food-insecurity, and moderately food-insecurity groups. The research also found that women from fruit and vegetable producing households were 15 percent less likely to be anemic than households that did not produce fruits and vegetables. No severely anemic women were found in households that produce fruits and vegetables. In addition to improving individuals' health and nutrition this study shows that fruit and vegetable intensification interventions could have positive economic impacts on communities.

The findings of the study were recently published in an IFPRI discussion paper available here: <http://www.ifpri.org/sites/default/files/publications/ifpridp01346.pdf>

The full presentation is available here: http://horticulture.ucdavis.edu/main/events/dc_nutrition/griffiths.pdf

PoSHAN Community Studies, Nepal – Insights into the linkages between horticulture, diet and nutritional status

Presenter: Dr. Rolf Klemm, Johns Hopkins University, Helen Keller International

The Nutrition Innovation Lab-Asia Policy and Science for Health, Agriculture, and Nutrition (PoSHAN) Community Studies project (2013-2014) is using an annual and nationally representative sample of Village Development Committees (VDCs) from different agro-ecological zones including the mountains, hills and *terai* of Nepal to assess agricultural practices, household food access and security, diet, nutritional status, and anemia among mothers and young children to identify pathways for improving agriculture, marketing, nutrition and other public health programs in Nepal. This project is led by Johns Hopkins University. Collaborators include Tufts University (U.S.); Government of Nepal, USAID/Nepal, Tribhuvan University Institute of Medicine, and New Era, a local data management group (Nepal).

The first panel survey was conducted in 2013 to assess linkages between horticulture, diet, and nutritional status in mothers and children under five. The analysis measured how disease and a range of environmental, socioeconomic, sociocultural factors influence mothers' and young children's food security, diet, and nutritional status. By analyzing the survey data, researchers establish relationships between agricultural practices, food security and diet and children and mother's nutritional status, detect trends over time, identify the seasons of greatest food security and improved diet and nutrition. These findings are used to identify the most appropriate interventions to improve food security, diet, and the nutritional status of mothers and children in specific agri-ecological zones in Nepal.

Observations from the first survey found that there is variation in food security by agri-ecological zone with higher food security in the *terai*, a region with comparatively better agricultural practices, lowest prices of inputs, lowest food prices, and the highest levels of dietary diversity. However, mothers are more wasted and anemic and children are more wasted in the *terai* than the hill and mountain regions. Analysis of the survey data found that when there is household food insecurity, dietary diversity goes down and animal source foods are consumed less frequently. The landholdings in the regions are small with few households with gardens with fruit trees. Households owning specific productive assets consume more eggs, dairy, mango, papaya, and dark green leafy vegetables and not meat, beans, tomato, and gourd than households without those assets. The second survey is 85 percent complete and will be able to reveal trends in food security, diet, and nutritional status over time in various agri-ecological zones.

During the discussion period, the Nutrition Innovation Lab-Africa and Nutrition Innovation Lab-Asia stressed how factors including clean water and sanitation, safe foods, and instance of disease can impact the success of fruit and vegetable intensification interventions to improve the nutritional status of a population. Additionally, the Nutrition Innovation Lab presenters said that fruits and vegetables are linked to better nutritional outcomes, but it is unclear if there are specific anti-oxidants in fruits and vegetables that contribute to those outcomes.

The full presentation is available here:

http://horticulture.ucdavis.edu/main/events/dc_nutrition/klemm.pdf

USAID Nutrition Multi-Sectoral Nutrition Strategy 2014-2025

Presenter: Mike Manske, Nutrition Advisor, USAID

USAID's first multi-sectoral nutrition strategy (2014-2025) was released in May, an effort led by the Bureau of Global Health in consultation with representatives from other USAID Bureaus and offices including the Bureau for Food Security. Building on over fifty years of USAID's work on nutrition, the new strategy focuses on high impact and sustainability. It aims to contribute to reducing child stunting by 20 percent, to reduce the number of stunted children by 2 million over five years through Global Health, Feed the Future, and Food for Peace interventions, and to maintain acute malnutrition below 15 percent in humanitarian crises.

The strategy calls for more intensive nutrition efforts with an increased focus on nutrition interventions that promote behavior change and tracking the impact of behavior change messaging. The four planks of intensive nutrition programs include regular quality contact with mothers and direct caregivers; behavior change messages reinforced by government, communities, and media; nutrition-sensitive, health, agriculture, and WASH; and improved quality and expanded collection and use of data.

USAID aims to make horticulture, aquaculture, legume, and livestock programs more nutrition-sensitive by tracking consumption of nutritious foods and establishing nutrition targets and activities. The strategy also presents a new way to consider the agriculture-nutrition nexus in program designs, greater variety of service delivery platforms (economic growth and health offices at mission level), strengthening the evidence base, emphasizing country-level

commitment to agriculture, and providing additional technical guidance and technical assistance for missions.

The full presentation is available here:

http://horticulture.ucdavis.edu/main/events/dc_nutrition/manske.pdf

To read the new Multi-Sectoral Nutrition Strategy (2014-2025) click here:

http://www.usaid.gov/sites/default/files/documents/1867/USAID_Nutrition_Strategy_5-09_508.pdf

Facilitated Discussion

Discussion Question, Group 1

In your work, what limits the incorporation of fruits and vegetables into diets? Consider availability, production and marketing challenges, cultural acceptance, etc.

Concluding statement: Quality fruits and vegetables are difficult to produce and market and traditions and availability are barriers to consumption, but improved production and market access and opportunities for women can overcome these barriers.

Discussion of challenges:

- Postharvest and food safety
 - Must be able to sell, ensure a market
- Women do not have good access to the market and cannot sell
- Question of whether cooperatives works. There can be trust issues.
- Difficult to meet children's nutritional needs
- Seasonal and timing constraints
- Maize mentality limits diversity of crops produced, sold, and consumed.
- Ability to sell at market
- Production challenges – water, cold chain, transportation

Discussion Question, Group 2

In your work, are there aspects of fruit and vegetable production or marketing that could be improved? Where would the biggest gains be made? Consider the entire value chain from seed systems to postharvest to marketing.

Concluding statement: Big gains can be made by focusing on postharvest loss, marketing nutritious foods, and scaling up.

Discussion of challenges:

Improvements to production and marketing:

- Improved postharvest practices and improved transportation
- USAID-funded Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) program found it is important to communicate with agricultural audiences on

nutritional value of crops, requires good marketing. For example, you have to consider what to do if people don't want to eat certain crops like AIVs.

- For orange-fleshed sweet potato – convinced on the nutritional value, but less convinced that people want to eat it
- Provide nutrition education modules. For example, during a SPRING project field visit to Senegal they worked with farmers mainly on food security issues and conducted agriculture modules allowing five minutes for discussion on the nutritious value of the crops. They were also told the cost.
- Gender perspective – in training and outreach it is important to target both men and women
- Diet (regional preferences for vegetarian diet, e.g., India) linked to production, consumption
- Provide greater access to information on how to prepare foods. For example, a Cambodia project used a roaming food cart demo on a mobile cart to show farmers how to prepare foods. This allowed for greater access to farmers.
- Smallholders' illiteracy may limit effectiveness of tools including handouts and cookbooks

Gains that can be made:

- Increase number of adopters of new crops
- Promote behavior change
- Focus efforts on achievable goals
- Scale up

Discussion Questions, Groups 3 and 4

If you had greater research partnerships with either U.S. universities or in-country universities/research stations, what would be the first problem you would solve (related to fruits and vegetables and nutrition)?

Concluding Statement:

Farmers are consumers as well as producers/markets. Apply the research.

Discussion of challenges:

Problem to solve: Huge marketing strategy to encourage participation from “middle class”:

- Educating men: Provide access and availability (peri-urban and rural) to enhance including in diet. Have to educate men on importance of nutrition and vegetables
- Link conversation to/with private sector which will help promulgation of market opportunity
- Reducing women's work load (benefit to children)
- Lots of research (micro) but how can it be brought to a macro level?

Discussion Questions, Group 5

What would you recommend for a new call for research proposals that specifically addresses a nutrition/horticulture need you see in the field?

Concluding Statement:

Data on consumption understanding the balance between production for consumption and sale (men's vs women's crops), BCC, gender roles, youth, creative marketing, postharvest practices, and weaning foods.

Discussion:

- Incorporate gender into research, and disaggregate by sex/ ownership, and other variables.

- Consider women's preparation of food and children's nutrition and the value of weaning foods that have home grown vegetables.
- Projects should do more research involving youth in the value chain, through transportation, schools, entrepreneurship with youth, AMARI- micro loans. How do we capture the potential of youth to improve horticulture?
- What is the effect of postharvest handling on the vitamins and minerals of some of these crops? What is the tipping point for gender and production and income and production increases? The additional balance between growing for consumption vs sales. Assess the knowledge, attitude, and skills related to preferences. This will help establish the gaps and what needs to be targeted.
- How do you creatively market fruit and vegetables to improve consumption (reality shows, radio, bumper stickers)?
- Public nutrition programs via media
- Prenatal clinics that teach nutrition- weaning foods and kitchen gardens with these feeds.

Discussion Questions, Group 6

In your work, what are the challenges for integrating horticulture- and animal-based nutritional solutions into development projects?

Concluding statement:

Soil feeds crops, feeds animals, culture gender, landholding, selling instead of eating, nutrition education, integrated agriculture, livestock, nutrition extension, infant feeding.

Discussion of Challenges:

- Overcoming cultural barriers
- Infant/child feeding - calories, diversity, healthier babies
- Fertilizer use is limited
- Consuming fruits and vegetables in the household is a challenge, since they receive high prices, farmers sell them instead
- Dependence on staple crops
- Knowledge base – need more education/change in education system
- Agricultural extension used by development projects and are better off
- Despite the longstanding research, research isn't disseminated
- Need more sophisticated information transfer
- Need more one on one interlocutors
- Fruit and veggie markets at health places
- Gender – including both men and women so that crops don't get sold off

Discussion Questions, Group 7

In your work, how has diet diversification improved community/household nutrition?

Concluding statement:

Build evidence for consensus on measures of dietary diversification and on child-specific impact indicators of agriculture interventions.

- There is a lack of evidence about the relationship proposed in the question. There is also a lack of consensus on measurement of dietary diversity, with some challenges including: Difficulty of using one person's 24 hour recall to represent the experience of a larger group of people, i.e., is the person chosen to give the dietary information representative? Who is chosen to represent?
- How much food counts as "having eaten"?
- Different measurements use different numbers of food groups.
- Seasonality

Food security does not imply always food diversity

- Can improve knowledge but income limits implementation
- Link income generation projects with nutrition education, e.g., Global Livestock CRSP ENAM project in Ghana
- Marketing messages - to use in sale of food

"Nutrition-sensitive programs":

- To have more nutrition specific projects alongside economic growth projects.
- Improving maternal health messaging
- Agriculture interventions don't help children under 2
- Include child level nutrition indicators in project design

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