The Importance of Horticulture Research and Development to the Feed the Future Initiative

Speakers
- John Bowman, USAID/BFS
- Elizabeth Mitcham, Horticulture Innovation Lab at UC Davis
- Rangaswamy (Muni) Muniappan, IPM Innovation Lab at Virginia Tech
- Don Humpal, DAI

Facilitator
Zachary Baquet, USAID Bureau for Food Security

May 29, 2013
Upcoming Agrilinks Events:

- IPM Research Priorities | e-Consultation | June 4-7
- Sustainable Intensification Research Priorities | e-Consultation | June 18-21
- Ag Sector Council | June 26 | Scaling Up
Examining Integrated Pest Management Research Priorities

**June 4-7**
Online Facilitated Discussion: June 4 - 5
Additional Comment Period: June 6 - 7

**Day 1**
IPM Research Programmatic Focus & Comparative Advantages of U.S. Universities

**Day 2**
Human and Institutional Capacity Development & Transfer of IPM Technologies

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**DATE & TIME**

June 4 & 5: Facilitated Discussion

June 6 & 7: Additional Comment Period

The forum will remain open for additional comments and browsing but will not be facilitated.
Horticulture Research & Development in USAID’s Feed the Future Initiative

John E. Bowman, Ph.D.

Senior Agriculture Advisor
Office of Agricultural Research and Policy
Bureau for Food Security

Ag Sector Council

May 29, 2013
Why Horticulture??  Millennium Development Goals (MDGs)

1. **Eradicate extreme poverty and hunger**
2. **Achieve universal primary education**
3. **Promote gender equality and empower women**
4. **Reduce child mortality**
5. **Improve maternal health**
6. Combat HIV/AIDS, malaria and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development
Sustainability challenges:

- Climate change already impacting yields - farmers face drought, high temperatures and unpredictable climates
- As arable land is lost to urbanization and other uses, we need to produce more food on less land
- Crop diversification needed to improve diets and enhance incomes.... Thus

SUSTAINABLE HORTICULTURE!!
Which commodities/value chains are prioritized in East and Southern Africa?

<table>
<thead>
<tr>
<th>Staples</th>
<th>Kenya</th>
<th>Uganda</th>
<th>Tanzania</th>
<th>Rwanda</th>
<th>Ethiopia</th>
<th>Malawi</th>
<th>Zambia</th>
<th>Mozambique</th>
<th>S. Sudan</th>
<th>DR Congo</th>
<th>East</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
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<tr>
<td>Maize</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
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<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
</tr>
<tr>
<td>Other cereals</td>
<td>✖</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✖</td>
<td>✖</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cassava</td>
<td>✖</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✖</td>
<td>✖</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beans and legumes</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
<td>✖</td>
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<tr>
<td>Bananas</td>
<td>✖</td>
<td>✖</td>
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<td>✖</td>
<td>✖</td>
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<td>✖</td>
</tr>
</tbody>
</table>

| High-value crops         |       |        |          |        |          |        |        |            |          |          |      |
| Horticulture             | ✖     | ✖      | ✖        |        |          |        |        |            |          |          |      |
| Coffee                   | ✖     | ✖      | ✖        |        |          |        |        |            |          |          |      |
| Other high value crops   | ✖     | ✖      | ✖        | ✖      | ✖        |        |        |            |          |          |      |

| Animals                  |       |        |          |        |          |        |        |            |          |          |      |
| Dairy                    | ✖     | ✖      | ✖        | ✖      | ✖        |        |        |            |          |          |      |
| Livestock                |        |        |          |        |          |        |        |            |          |          |      |
| Fisheries                |        |        |          |        |          |        |        |            |          |          |      |

1 Other cereals: Kenya—‘orphan’ drought-resistant cereals; S. Sudan—sorghum; Ethiopia—wheat
2 Legumes: Uganda—beans; Rwanda—beans; Malawi—groundnuts, soya, pigeon peas; S. Sudan—groundnuts; Zambia—primarily groundnuts, soya, and sunflower; Ethiopia—pulses; Mozambique—soya, sesame, and groundnuts
3 Other high value crops: Rwanda—pyrethrum and avocado; Ethiopia—honey; Mozambique—cashews

www.feedthefuture.gov
## Which commodities/value chains are prioritized in Asia and Latin America/Caribbean?

<table>
<thead>
<tr>
<th>Asia</th>
<th>Latin America/Caribbean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bangladesh²</strong></td>
<td><strong>Nicaragua</strong></td>
</tr>
<tr>
<td><strong>Cambodia</strong></td>
<td><strong>Guatemala</strong></td>
</tr>
<tr>
<td><strong>Nepal</strong></td>
<td><strong>Honduras</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Staples</th>
<th>Asia</th>
<th>Latin America/Caribbean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Maize</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Pulses</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Tubers</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Beans</td>
<td>✗</td>
<td>✗</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>High-value crops</th>
<th>Asia</th>
<th>Latin America/Caribbean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits and Vegetables¹</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Coffee</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>Corn</td>
<td></td>
<td>✗</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Animals</th>
<th>Asia</th>
<th>Latin America/Caribbean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>Fisheries</td>
<td></td>
<td>✗</td>
</tr>
</tbody>
</table>

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¹ For Haiti – mangoes and avocados
² Still being analyzed

[www.feedthefuture.gov](http://www.feedthefuture.gov)
**FTF Research Strategy Analysis Outcomes**

**What?** Sustainable Intensification
Requires component technologies

**Where?** Specific focal Agro-ecologies
Spillovers to other region

**How?** Leveraging partnerships
US Universities
International Ag Research Centers
National Agriculture Research Systems
Private Sector – local and international
ESA MIXED MAIZE SYSTEMS: MOROGORO TANZANIA
ESA MIXED MAIZE SYSTEMS: MOROGORO TANZANIA
Major USAID FTF Hort Initiatives

Run by ARP Office (Wash-DC)

1. Innov. Labs (Hort & IPM)
2. AVRDC and CGIARs
3. Biotechnology (eggplant, potato, papaya, banana)
4. Biofortification (Harvest Plus - OFSP)

Run by Field Offices (Missions)

1. VALUE CHAIN PROJECTS
Horticulture Portfolio Priorities

1. Relationship-building with Mission projects

2. Role in “Sustainable Intensification”

3. Role in “Technology Scaling”
AFRICAN INDIGENOUS VEGETABLES (AIVs)
AIVs: AVRDC (BREEDING, SEED SUPPLY)
AIVs: HORTICULTURE INNOV. LAB (AGRONOMICS, NUTRITION)
COLLABORATION: KENYA AIVs
(KHDP, Hort. IL, AVRDC, Industry, HIV Clinics)
1. Horticulture Innovation Lab (UC-Davis; technology development)

2. IPM Innovation Lab (Virginia Tech; adaptive research)

3. DAI (FTF Value Chain Implementer; Haiti, Liberia, Tajikistan)
Supporting Horticulture for Nutrition and Income Generation

Horticulture Innovation Lab

Formerly Horticulture CRSP

Elizabeth Mitcham, Ph.D. Director

Innovation Lab Meeting – Tanzania, March 2013
The value of horticulture

- High value crops – income generation and diversification
- Intensive farming possible on small plots
- Nutritional benefits of diet diversification
- Women are heavily engaged in horticulture crop production and marketing
The more diverse the diet, the better the chance of adequate nutrition

Dietary diversity has been associated with nutrient adequacy and nutritional status (independent of socioeconomic status)

MPA = Mean probability of adequacy
- Low dietary diversity is linked to higher rates of malnutrition among infants and young children

- Improving on-farm crop diversity through horticulture increases the likelihood that a family will diversify their diet

- Nutrient-dense foods, such as fruits and vegetables, are necessary for optimal mental and physical growth throughout development (Arimond & Ruel, 2004; Arimond et al., 2010; Ruel, 2003)
Increasing the production of nutrient dense foods, especially fruits and vegetables, is one of the most effective strategies to improve year-round micronutrient intakes and create healthy diet patterns (Herforth, FAO 2012).

Other proven strategies include increasing women's share of income, as well as increasing production of underutilized fruits and vegetables such as African Indigenous vegetables.

Horticulture CRSP has projects addressing all of these areas.
Gender and Horticulture

- Women grow and/or provide the labor for many horticultural crops
- Women participate in markets that men may not be participating in

- The gap between women and men’s incomes from the same crops is wide because women lack access to inputs, land, and education
- Closing this gap with sound research and development leads to female empowerment, better nutrition, and increased family education.
Improved Horticulture Technologies

- Improves production
  - Technologies adapted to women’s needs can increase production

- Saves women time and reduces their unpaid labor
  - Weeding, irrigating, harvesting, planting, etc.

- Improves processing techniques
  - Making them movable, easy to use, etc.

- Improves women-led businesses

- Ultimately improves household nutrition (due to more income, time and highly nutritious foods)
Key to Adoption of All Improved Horticulture Practices is a Viable Market

- Likely return on investments made is key
- Reliable market for crop
- Ability to store crop short time provides essential bargaining power (cool storage)
- Transportation to market
- Farmer associations can be instrumental
Technologies being tested by the Horticulture Innovation Lab

- Seed drying beads
- Pest exclusion nets
- CoolBot and coolrooms
- Solar drying
- Soil solarization
- Improved market linkages
- Nutritional value of indigenous vegetables
- Orange fleshed sweet potato drying for flour
- New variety evaluation
- Solar powered irrigation
CoolBot and Cold Rooms

Air conditioner thermostat
Heat from Cool-bot

Cool-bot frost sensor in air conditioner fins

Air conditioner thermostat
Heat from Cool-bot
Potato harvest in Bangladesh
Problems with ambient storage
We will be comparing CoolBot cold rooms with simple ‘ambient’ storage and ‘improved ambient’ storage systems designed by BRAC.
High humidity reduces seed viability

Drying beads

- Made of special type of zeolite
- Can be reused indefinitely
- Can be used for both drying and storing

Farmers can dry seeds to very low moisture contents

Farmers plant healthier seeds with increased yield and germination
Keeping seed dry improves germination

- Most vegetable seeds dried with the beads germinated better than those dried in the sun
Opened a Postharvest Training and Services Center in Arusha, Tanzania (at World Vegetable Center)

Trained 36 Master Trainers in advanced postharvest practices

Intent on training over 10,000 farmers in Africa each year
Strengthening the value chain for African indigenous vegetables

- Improving the African indigenous vegetable value chain
  - Varieties
  - Production practices
  - Marketing
  - Nutritional value
Linking farmers to markets

- Linking new woman farmers to buyers at local hotels and supermarkets
- Strengthening production practices and the postharvest value chain
Participatory Market Chain Analysis (PMCA)

Phase 1: Identify market chain actors (players, activities, ideas, problems)
- Conduct market appraisal
- Meeting #1 where all actors come together

Phase 2: Analyze in participatory manner potential joint business opportunities
- Market chain actors work in “thematic groups”
- Meeting #2 where actors come together to present progress in thematic groups

Phase 3: Implement joint market innovations
- Thematic groups create new products, technologies, institutions
- Meeting #3 where groups present innovations
Insects reduce crop yield

Pest exclusion nets
  ◦ Create a barrier that protects vegetables against pests
  ◦ Improve ambient conditions
  ◦ Can be locally made and reused

Farmers are able to implement nets into an Integrated Pest Management program that relies less on pesticides
Regional Centers of Innovation

- Central America
  - Zamorano University, Honduras

- Southeast Asia Center
  - Kasetsart University, Thailand

- East Africa Center
  - Participatory Training Center
    - KARI–Thika, Kenya

We were innovation before innovation was cool!
Thank you!!

For more information:

http://hortcrsp.ucdavis.edu

Thanks to our many collaborators, including:

CIP
Kasetsart University
Kenya Agric. Research Institute
Michigan State University
Rutgers, The State University of New Jersey
Postharvest Education Foundation
Purdue University
University of California
Zamorano University
Feed the Future Innovation Lab for Collaborative Research on Integrated Pest Management (IPM)
IPM Key for Green Agriculture

R. Muniappan
Director, Integrated Pest Management Innovation Lab
Virginia Tech

May 29, 2013
Crops addressed in the IPM Innovation Lab

Vegetable and Root crops
- Tomato - Cucurbits
- Eggplant - Crucifers
- Pepper - Beans
- Potato - Onions
- Okra - Cassava

Fruit and cash crops
- Banana - Citrus
- Cacao - Coffee
- Mango - Naranjilla
- Passion Fruit
- Tree Tomato

Cereal Crops
- Sorghum - Wheat
- Rice
IPM Package for Tomato

• Solarization of seed beds and greenhouses
• Healthy and disease-free seed selection
• Seed or seedling treatment with *Trichoderma, Pseudomonas fluorescens*, and *Bacillus subtilis*
• Use of VAM, neem cake and other organics
• Grafting on resistant rootstock for bacterial wilt, Fusarium and others
• Staking and mulching
• Yellow sticky traps for thrips, leafminers etc.
• Pheromone traps for monitoring *Helicoverpa* and *Spodoptera*
• Host-free period and rogueing for control of virus diseases
• Use of biopesticides such as neem
• Use of microbial pesticides such as NPV, *Metarhizium*, and *Beauveria*
• Tackling invasive species such as *Tuta absoluta*
Selection of disease-free seeds and production of healthy seedlings in net houses
Production and use of *Trichoderma*

*Trichoderma* workshops conducted in India trained scientists from Bangladesh, Ghana, Honduras, Indonesia, Kenya, Kyrgyzstan, Senegal, and Uzbekistan.
Trichoderma field trials

Indonesia

Broccoli produced with and without *Trichoderma* in Indonesia.

The Philippines

A garlic field in the Philippines showing cultivation without and with *Trichoderma*.

India

Left: Okra fields in India show cultivation without and with *Trichoderma*. 
Eggplant and tomato grafting in Bangladesh

Eggplant grafting in Bangladesh
• Eggplant yield ↑ 249% in Bangladesh
• Income ↑ 305% in Bangladesh
• Technology transferred from Bangladesh to Ohio
• Technology transferred to India, Nepal, Philippines, Uganda, Honduras, Ecuador, Senegal, and Kenya
• Mostly women involved in grafting
Grafting, continued

Grafting naranjilla for *Fusarium* wilt control in Ecuador

Grafting tomatoes for bacterial wilt control in Kenya
Pheromone production and use
Production of biocontrol agents and their uses

A nest for ants to control cacao pod borer.

Mass culture of *Helicoverpa* for production of NPV.

Use of biocontrol agents can reduce pests while at the same time not harming the environment.

Predaceous mite production.

Orius bug production in Honduras.
Biopesticide – Neem and its use
Gemini virus control in tomato

The gemini virus is transmitted by whiteflies, primarily the *Bemisia tabaci*.

A “host-free” period for 3 months is effective in reducing the incidence of gemini virus.
## Selected impacts of the IPM Innovation Lab

<table>
<thead>
<tr>
<th>Country and Authors</th>
<th>Crop</th>
<th>IPM Practice(s)</th>
<th>Net Benefits (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uganda, Debass, 2000</td>
<td>Beans and maize</td>
<td>Cultural</td>
<td>$36-202</td>
</tr>
<tr>
<td>Bangladesh, Debass, 2000</td>
<td>Eggplant, cabbage</td>
<td>Cultural practices</td>
<td>$26-29</td>
</tr>
<tr>
<td>Bangladesh, Rakshit et al, 2011</td>
<td>Cucurbits</td>
<td>Pheromone traps</td>
<td>$3-6</td>
</tr>
<tr>
<td>Ecuador, Baez, 2004</td>
<td>Plantain</td>
<td>Cultural</td>
<td>$59-63</td>
</tr>
<tr>
<td>Ecuador, Quishpe, 2001</td>
<td>Potato</td>
<td>Resistant variety</td>
<td>$50</td>
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<tr>
<td>Albania, Daku, 2002</td>
<td>Olives</td>
<td>Cultural</td>
<td>$39-52</td>
</tr>
<tr>
<td>Honduras, Sparger, et al, 2011</td>
<td>Eggplant, onion, tomato, and pepper</td>
<td>Cultural practices</td>
<td>$17</td>
</tr>
<tr>
<td>India, Norton, et al, 2013</td>
<td>Mulberry, papaya, cassava</td>
<td>Papaya mealybug parasitoid release</td>
<td>$500 -1,300</td>
</tr>
</tbody>
</table>
IPM Innovation Lab’s cost-benefit ratio

- IPM IL budget for 20 years: $50 million
- Benefits from IPM IL: $750 to 1,750 millions
- Cost-benefit ratio: 1:15-35
Invasive Species

Clockwise from top left:
Banana leaf roller
Papaya mealybug infestation
Papaya plantation damaged
Papaya mealybug parasitoid
Tomato leafminer, *Tuta absoluta*
Cassava mealybug
Gender in IPM Innovation Lab

Nepal

Mali

Indonesia

India

Bangladesh

Cambodia
USAID India mission representatives in the IPM Innovation Lab field

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Thank You!
The Importance of Horticultural Research and Development in the Feed the Future Initiative

Don Humpal, Senior Agriculturist | DAI
Ag Sector Council Seminar, May 29, 2013
Since 1970 - Ideas into Action – Action into Impact

Currently Implement about 100 projects in 70 countries


Staff of about 2,300 and about 70 percent local
Horticultural Market Research - Zambia

Figure 6. Simplified Channel Map of Lusaka FFV System

Production
- Neighboring Countries
  - Onions, oranges

Assembly
- Small Farms
  - Rape, tomato
  - Cabbage, onion, banana, orange

- Large Farms
  - Cabbage, onion, banana, Irish potato
  - Tomato
  - Pineapple

Wholesale Markets
- (Primarily Soweto in Lusaka, with some activity in outlying markets; Main Masala market in Ndola)

Wholesale Markets
- Street Vendor (9%)
- Chain Supers (7%-10%)
- Small Supers (7%-11%)
- Other (2%)

Retail
- Open Air Markets (70%-82%)

Small Flow → Medium Flow → Large Flow

Hichaambwa and Tsahirley, 2007

Shaping a more livable world.
Table 1. Shares of Different Food Categories in Total Food Expenditure, by Per Expenditure Tercile in Lusaka

<table>
<thead>
<tr>
<th>Food items</th>
<th>Overall</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of households</td>
<td>267,934</td>
<td>97,737</td>
<td>93,005</td>
<td>77,192</td>
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<tr>
<td>Mean adult equivalent income (K'000)</td>
<td>5,791</td>
<td>1,959</td>
<td>4,253</td>
<td>12,495</td>
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</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Overall</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals &amp; staples</td>
<td>24.1</td>
<td>28.4</td>
<td>24.2</td>
<td>18.7</td>
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<tr>
<td>Dairy items</td>
<td>5.2</td>
<td>3.5</td>
<td>5.9</td>
<td>6.7</td>
</tr>
<tr>
<td>Meat &amp; eggs</td>
<td>16.8</td>
<td>14.1</td>
<td>18.0</td>
<td>18.6</td>
</tr>
<tr>
<td>Fish</td>
<td>7.6</td>
<td>8.8</td>
<td>7.3</td>
<td>6.5</td>
</tr>
<tr>
<td>Vegetables</td>
<td>13.7</td>
<td>17.6</td>
<td>12.9</td>
<td>9.8</td>
</tr>
<tr>
<td>Fruits</td>
<td>3.6</td>
<td>2.7</td>
<td>3.9</td>
<td></td>
</tr>
<tr>
<td>Pulses</td>
<td>3.7</td>
<td>4.7</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>Sugar &amp; oils</td>
<td>7.9</td>
<td>10.1</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Other foods</td>
<td>4.7</td>
<td>3.3</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>Tobacco &amp; alcohol</td>
<td>5.3</td>
<td>3.0</td>
<td>5.6</td>
<td></td>
</tr>
<tr>
<td>Food away from home</td>
<td>7.3</td>
<td>3.8</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>


Figure 5. Total Supply of Onion to Soweto Market, by Month and District (Top Three Districts), January 15, 2007 to January 15, 2009


Tschirley and Hichaambe, 2010
RECENT/CURRENT PROJECTS

Burundi Agribusiness Program – 2007-2012
- Revitalize the agricultural sector, agro-enterprises, rural incomes
- Value Chains in coffee, horticulture, finance, SME incubator

Tajikistan – Feed the Future: Family Farming Project – 2010-2014
- 46,000 households targeted
- Agricultural production and income, nutrition, water user associations

- 54,000 households targeted
- Agricultural productivity, private enterprise, human capacity
Supply Side Activities - 15
Association 67% female members
Demand Side Activities – packing, cold chain, processing partners
Cross Cutting Activities – market information, irrigation, gender inclusiveness, VC finance
Tajikistan – Family Farming

**Nutrition Garden Crops**
- Bean, Dry
- Cabbage
- Carrot
- Cauliflower/Broccoli
- Cucumber
- Onion
- Peanut
- Pepper, Sweet
- Pumpkin
- Red Beet
- Spinach
- Tomato

**TABLE 14. NUTRITION DEMONSTRATION PLOTS AND DISTRICTS**

<table>
<thead>
<tr>
<th>Districts</th>
<th>Number of demonstration sites</th>
<th>Number of individual crop-plots demonstrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gumsangir</td>
<td>11</td>
<td>90</td>
</tr>
<tr>
<td>J.Rumi</td>
<td>5</td>
<td>39</td>
</tr>
<tr>
<td>Sarbd</td>
<td>4</td>
<td>34</td>
</tr>
<tr>
<td>Vakhdah</td>
<td>4</td>
<td>37</td>
</tr>
<tr>
<td>A.Jomii</td>
<td>16</td>
<td>54</td>
</tr>
<tr>
<td>Khuroson</td>
<td>7</td>
<td>51</td>
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<tr>
<td>Yovon</td>
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<td>18</td>
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<tr>
<td>Bokhtar</td>
<td>7</td>
<td>49</td>
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<tr>
<td>Nosiri Kharav</td>
<td>33</td>
<td>239</td>
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<tr>
<td>Shahrius</td>
<td>19</td>
<td>114</td>
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<tr>
<td>Qulbodyon</td>
<td>33</td>
<td>223</td>
</tr>
<tr>
<td>Jilikul</td>
<td>15</td>
<td>94</td>
</tr>
<tr>
<td>Total</td>
<td>156</td>
<td>1082</td>
</tr>
</tbody>
</table>

**Table of Trainings and Food Nutrition Education Demonstrations and Health Trainings**

<table>
<thead>
<tr>
<th>Topic</th>
<th># Of Trainings and demonstration</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFP staff conducted nutrition education sessions / demonstrations and health trainings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education session &quot;Nutritious and diverse diets for Pregnant and Lactating Women &quot;</td>
<td>48</td>
<td>858</td>
</tr>
<tr>
<td>Education session &quot;Breast-feeding and diverse and quality food for children under 2 years &quot;</td>
<td>58</td>
<td>1055</td>
</tr>
<tr>
<td>Training &quot;Health, hygiene and safe drinking water&quot; People trained in child and mother health and nutrition, health education, hygiene and sanitation</td>
<td>52</td>
<td>903</td>
</tr>
<tr>
<td>Total</td>
<td>158</td>
<td>2826</td>
</tr>
</tbody>
</table>

Nutrition field agent, Jamila Samadova explaining to US Ambassador Susan Elliott and Deputy Prime Minister Murudali Alimardon the recipes and crops recommended in FFP nutrition gardens plots during Agro Expo, March 1, 2013

Shaping a more livable world.
After training and consultations with FFP agronomists, Bozorboy decided to use his greenhouse (in which he previously grew lemon trees) to plant cabbage and cauliflower. He is very pleased with good yields and profits.
Liberia Food and Enterprise Development – Vegetable Crops

- **Crop Species and Cultivars**
  - Maize, bitterball, okra, chili, mustard, collards
  - AVRDC for tropically adapted cultivars of chili

- **Seed Availability and Quality**
  - Seed testing, dry season seed production
  - East-West Seeds, other input suppliers

- **Sheet and Rill Erosion Management**
  - Contour bed alignment
  - Contour stabilization vetiver and moringa

[Map of Liberia showing Value Chain Commodities 2011/2012]

- [Image of people cultivating vegetables]

- **Shaping a more livable world.**
Liberia Food and Enterprise Development

**Soil Fertility**
- Boima Engineering Soil Chemistry Lab
- Deep placement, compost, biochar
- Micronutrient supplementation – S, Bo, Mg

**Pests and Diseases**
- Pest and Disease Identification
- Broad Mite in dry season chili
- Fruit flies - enlarged list of invasives
- Beneficial insects identification - IPM

**Seedling Production**
- Training for 17 nursery owners in 6 counties
- Technical assistance on plant nutrition, pest and disease management

**Irrigation Equipment**
- 5 workshops trained in pump and tubewell manufacture
- Dry season irrigation equipment sales

**Drying Equipment**
- Workshop trained in forced air drier manufacture

**Phytosanitary Policy**
- Plant material and seed importation policy not formalized
- Phytosanitary regulations in development

Shaping a more livable world.
Thank You
Visit: www.dai.com
Thank you for joining us!

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You can visit the event page to post comments & questions.

Stay In Touch

Contact Us:
agrilinks@agrilinks.org

OR

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zbaquet@usaid.gov

Upcoming Events

IPM e-Consultation | June 4-7

Sustainable Intensification e-Consultation | June 18-21

Scaling Up Technology ASC Seminar | June 26

Agrilinks and the Agriculture Sector Council Seminar Series are products of the USAID Bureau for Food Security under the Knowledge-Driven Microenterprise Development (KDMD) project.