USAID’s Agricultural Research Strategy: The Role of Post-Harvest Loss

John E. Bowman, Ph.D.

Office of Agricultural Research and Policy
USAID Bureau for Food Security

UC-DAVIS Post Harvest Forum
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OUTLINE OF TALK

1. Overview of FTF PH Investments
2. Examples
3. Issues/Challenges
Major USAID FTF PH Initiatives

Run by ARP Office (Wash-DC)
1. Innov. Labs (Hort, IPM, RPHL, Food Processing, Bean/Cowpea, INTSORMIL)

2. AVRDC (Core + PH)

3. CGIARs (IRRI, CIMMYT, CIP, CSISA)

4. Biotechnology (ABSP2 – LBR potato/AATF – insect resistant cowpea)

Run by MPI (Wash-DC)

1. AflaSTOP
Major USAID FTF PH Initiatives

Run by Missions

1. **Rwanda** – PHH + storage
2. **EAR** – Compete/MLI
3. **Tanzania** – TAPP, Tuboroshe
4. **Kenya** – KHCP/KAVES
5. **Ghana** – ADVANCE
6. **Uganda** – WFP-P4P, UCE, DANIDA/ABI-Trust
Program for Sustainable Intensification (e.g. IPM IL, SANREM IL, CSISA, Africa Rising)

Program for Climate Resilient Cereals (e.g. Cereals RFA, DTMA, Arcadia PPP, Ceres PPP, CGIAR Rice/Wheat/Maize, Sorghum/Millet RFA)

Program for Advanced Research on Animal and Plant Diseases (e.g. USDA Partnerships under NBCRI, LCC IL, Virus Resistant Cassava)

Program for Productive Legume Research (e.g. Dry Grain Pulse IL, Peanut /Mycotoxin IL, CGIAR Legumes, NBCRI)

Program for Safe & Nutritious Foods (e.g. Horticulture IL, Nutrition IL, Aquafish IL, AVRDC, Aflatoxin under NBCRI, Post Harvest IL)

Program for Policy Research & Support (e.g. AMA IL, Program for Biosafety Systems, Enabling Agricultural Trade)

Program for Human & Institutional Capacity Development (e.g. MEAS, InnovATE, MAETS, AWARD, LEAP)
Links research on the production and processing of safe, nutritious agricultural products to a learning agenda on household nutrition, including the utilization and access to fruits, vegetables, meat, fish, dairy and legumes with the goal of improving child survival, securing family investments in agriculture, and preventing and treating under-nutrition.

**Program Area Technical Lead:** John Bowman

<table>
<thead>
<tr>
<th>Current Activities</th>
<th>Activity Manager</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticulture Innovation Lab</td>
<td>John Bowman</td>
<td>UC - Davis</td>
</tr>
<tr>
<td>Horticulture Innovation Lab Assoc. Award: LAC Assessment</td>
<td>John Bowman</td>
<td>UC - Davis</td>
</tr>
<tr>
<td>World Vegetable Center-AVRDC (Core)</td>
<td>John Bowman</td>
<td>AVRDC</td>
</tr>
<tr>
<td>World Vegetable Center-AVRDC (Post Harvest)</td>
<td>John Bowman</td>
<td>AVRDC</td>
</tr>
<tr>
<td>USDA/NBCRI/Aflatoxin</td>
<td>Tor Edwards</td>
<td>USDA/ARS</td>
</tr>
<tr>
<td>Post Harvest Loss Reduction Innovation Lab</td>
<td>Ahmed Kablan</td>
<td>Kansas State University</td>
</tr>
<tr>
<td>Nutrition Innovation Lab - Africa</td>
<td>Maura Mack</td>
<td>Tufts University</td>
</tr>
<tr>
<td>Nutrition Innovation Lab - Asia</td>
<td>Maura Mack</td>
<td>Tufts University</td>
</tr>
<tr>
<td>CRP 4.0 - Nutrition</td>
<td>Maura Mack</td>
<td>IFPRI</td>
</tr>
<tr>
<td>Adapting Livestock to Climate Change Innovation Lab</td>
<td>Joyce Turk</td>
<td>Colorado State University</td>
</tr>
<tr>
<td>Aquafish Innovation Lab</td>
<td>Shivaun Leonard</td>
<td>Oregon State University</td>
</tr>
<tr>
<td>Aquafish Innovation Lab Associate Award</td>
<td>Shivaun Leonard</td>
<td>Oregon State University</td>
</tr>
<tr>
<td>CRP 3.7 – Meat, Milk and Fish</td>
<td>Shivaun Leonard</td>
<td>ILRI</td>
</tr>
<tr>
<td>Food Processing Innovation Lab</td>
<td>Angela Records</td>
<td>University of Illinois</td>
</tr>
<tr>
<td>Harvest Plus</td>
<td>Vern Long</td>
<td>IFPRI</td>
</tr>
<tr>
<td>Golden Rice</td>
<td>John McMurdy</td>
<td>IRRI</td>
</tr>
</tbody>
</table>
USA one of the Founding Nations of AVRDC – The World Vegetable Center
AVRDC – Global Agricultural R&D

Taiwan
Niger
Tanzania

Cameroon
Madagascar
Thailand

Solomon Islands
Mali
India
Breeding

Crop management

Fresh produce handling

Processing

AVRDC – PHL Mgmt.

Variety trials on station/on farm

Quality/shelf life responses to irrigation

Packaging, storage, special treatments

Drying; sauce processing
AVRDC: Tomato - disease resistance and better marketability

Tomato varieties ‘Tanya’, ‘Tengeru-97’, ‘Kiboko’, ‘Tengeru 2010’ and ‘Duluti’ – disease resistant, more even ripening but also with thicker, stronger skins that make the tomato fruits better able to withstand transportation to market without bruising.

+ 40% increase in production and incomes in Tanzania
AVRDC – PH quality issues

Abiotic and biotic stress tolerance, selection for Brix values (sugar) and lycopene content for paste and sauce production – activities often done in partnership with private sector producers and processors.

AVTO1006 Ty-2+Ty-3

AVTO1008 Ty-2+Ty-3
New: POST HARVEST LOSS PROJECT
- AVRDC ESA Office, Arusha, Tanzania
- Global: Tanz., Kenya, Mali, Ghana, Ethiopia, Bangladesh, Cambodia
- Reduce postharvest losses of high volume, high value vegetable commodities
- Participatory assessments, gap analysis, workshops/trainings
- Develop and promote appropriate, low-cost postharvest technologies in collaboration with public and private sectors
AVRDC PH TRAINING CENTER
AVRDC PH TRAINING CENTER
AVRDC PH TRAINING CENTER
WODSTA WOMEN’S PROCESSING: AVRDC/HORT LAB
WODSTA WOMEN’S PROCESSING: AVRDC/HORT LAB
IPM Innovation Lab Program
(formerly CRSP)

Virginia Tech University

http://www.oired.vt.edu/ipmcrsp/
IPM CRSP Host Country Regions in 2009-2014
6 Regions – 17 Countries
IPM Packages - Components

- Soil treatment – Solarization, VAM, *Trichoderma*
- Seed treatment – *Trichoderma*, *Pseudomonas*
- Physical control – Hot water, Sticky traps
- Grafting – Bacterial and Fusarium wilt resistance
- Cultural control – Roguing, Host free period
- Biopesticides – Neem, NPVs, Bt, *Metarhizum*
- Pheromone traps – Fruit flies, *Helicoverpa*
- Resistant varieties – Virus and bacterial diseases
- Biological control – Use of parasitoids and predators
Potato Tuber Moth Larva/ Pupa

Potato Tuber Moth Adult

Potato Tuber Moth

• Pheromone traps for monitoring potato tuber moth population in Mali
• The study was designed to provide information on the occurrence of potato tuber moth (PTM) *Phthorimaea operculella*.
• Traps baited with pheromone lures were used for monitoring potato tuber moth populations in Mali.
Sweet Potato Weevil - Indonesia

Grub feeding on a tuber

Resulting damage

Sweet potato weevil adult
Sweet Potato Weevil

- Pheromone traps for sweet potato weevil in West Sumatera

- The objective of this study was to compare the use of sex pheromone traps and traps using fresh sweet potato tubers.

- The study showed that the trap using pheromone caught more adults of *Cylas formicarius*.

- Currently pheromone traps combined with biocontrol agents, *Metarhizium* and *Beauveria* are being tested.
Feed the Future Innovation Lab for the Reduction of Post-Harvest Loss

Funded by:

Program Area 5:
Reduced Post-Harvest Losses and Food Waste

University Partners:
Kansas State University
University of Illinois at Urbana-Champaign
Oklahoma State University
Fort Valley State University
South Carolina State University
University of Nebraska, Lincoln
University of Kentucky
PHL Innovation Lab Initial FtF Focus

Countries

- Bangladesh
- Ethiopia
- Ghana
- Guatemala
PHL Lab Goals

• Enhancing **capacity** to improve drying, conditioning, handling, storage, pest management, transportation, grading, standardization and marketing of their crops

• Expanding access to Post-Harvest Service Centers utilizing "Warehouse Receipt Systems" (WRS) (**value chain access**)

• Pilot testing of promising “on the shelf” and “in the field elsewhere” **best practices and technologies**
Team Members (U.S. Institutions)

- Oklahoma State University
- University of Nebraska
- Fort Valley State University
- University of Kentucky
- USDA-ARS Center for Grain and Animal Health Research
- South Carolina State University
- University of California Davis
PHL Lab Team

Alliance Partners (International Universities)

• Bahir Dar University (Ethiopia)
• Bangladesh Agriculture University (Bangladesh)
• Bern University of Applied Science (Switzerland)
• Kwame Nkrumah University of Science (Ghana)
• Makerere University (Uganda)
• Mekelle University (Ethiopia)
• University of Hohenheim (Germany)
• Universidad Del Valle (Guatemala)
• …
Alliance Partners (International Agencies)

- CGIAR’s International Rice Research Institution (IRRI)
- CGIAR’s International Center for Agricultural Research in the Dry Areas (ICARDA)
- CGIAR’s International Maize and Wheat Improvement Center (CIMMYT) (invited)
- United Nations Food and Agriculture Organization (FAO)
- ...
Alliance Partners (Companies)

- ADM (USA)
- Agri Commercial Services (Ghana)
- Hiwot Agricultural Mechanization (Ethiopia)
- John Deere (USA)
- Pens Food Bank (Ghana)
- Romer Labs (Austria)
- Vestergaard Frandsen (Switzerland)
- Woods End (USA)
- ...
Solar tunnel dryer

- chimney
- baffle plate
- cover sheet
- biomass furnace
- collector
- tunnel dryer
- heat exchanger
- centrifugal blower
- air outlet
- substructure base
- wooden substructure
- air inlet

Fig. 1. Solar tunnel dryer with integrated collector and biomass furnace.
Hermetic Storage
Cocoons Bayer Philippines. Hybrid Rice.

Cocoon in Laos. Grainbank.
Silos (CIMMYT/SDC Design)
Dr. Dirk E. Maier, Ph.D., P.E.
Professor and Head
Dept. of Grain Science & Industry
Director, IGP Institute
Kansas State University
Manhattan, Kansas, U.S.A.
dmaier@k-state.edu
www.grains.k-state.edu
www.reducePHL.org

“Leaders & Knowledge for the Global Grain Industry”
Feed the Future Innovation Lab for Food Processing and Post-harvest Handling (Purdue Food Processing Lab)

Funded by
(RFA-OAA-12-000036)

Program Area # 5:
Reduced Post-Harvest Losses and Food Waste

Partners:
North Carolina A&T State University
University of Pretoria, South Africa
Institut de Technologie Alimentaire, Senegal
Jomo Kenyatta Univ. of Agric. & Technology, Kenya
University of Eldoret, Kenya
CIMMYT, Kenya
International Institute of Tropical Agriculture, Nigeria
A to Z Textiles, Arusha, Tanzania
Food Processing Lab

Goal: To develop sustainable, market-driven value chains that reduce food losses, improve food and nutrition security, and contribute to economic growth for farmers in KENYA and SENEGAL, and other FTF countries.
**Product Development**

- High quality processed products
  - Pre-gelatinized instant porridges
  - Couscous
- Nutritionally enhanced products

**Improving Processes/Mechanization**

- Agglomerator
- Decorticator
- Packaging
Entrepreneurship: Incubation Centers

Services at the Center

• **Training**
  – Technical /business skills
  – Process demonstrations
  – Testing learned skills with oversight

• **Exceptional support**
  – Business and market consultation
  – Equipment repair
  – Limited facility use

• **Optimized product output**
  – Continuous R&D
  – Scale-up support

• **Farmer organizations**
USAID-KHCP PRESENTATION
Map of USAID-KHCP Activities
Fine beans production for export
Chillies processing & indigenous amaranth dehydration for export
Tanzania Agriculture Productivity Program (TAPP)

Managed by Fintrac Inc.
Increasing incomes

1. Improved production practices and higher yields

E.g. Good Agricultural Practices doubled carrots profits for father and son, Oldonyosambu, Arusha

- Use of raised beds
- Carrots planted 8 centimeters intervals for proper room to grow
- 150 grams of seed used in a 250 square meter farm
- Controlled watering plan (5 hours watering in 12 days) – drip irrigation system
- 8 bags of weighed 80 kg harvested in a 250 square meter farm
Charcoal Coolers – Zanzibar

Such coolers are useful as the first part of a cold chain, i.e. the produce will go to a cold truck or fridge.

They can take out the field heat in the field, which can reduce the load on subsequent coolers easier.
Correct Curing

Onions well cured can store much longer giving access to higher priced markets. Training is given for correct field conditioning.

Curing of vanilla is part of a partnership with TAPP/USAID/Fintrac and Kilimanjaro vanilla farmers.
TAPP is embarking on solar drying programme with women's groups. By improving the drying techniques – dried snacks – pineapple, mango; dried teas – rosella, lemon grass; dried baby foods – butternut squash; dried green leaved – eg spinach sweet potato leaves are all turned into processed products.
LUSHTOTO PACKHOUSE - GoT
LUSHOTO PACKHOUSE - GoT
TAHA COLLECTION CENTER: MIDAWE
TAHA COLLECTION CENTER: MIDAWE
Key Washington Research Projects (ARP/MPI)

- Peanut/Mycotoxin Innovation Lab
- Nutrition Innovation Lab/Uganda Community Connector
- NBCRI with USDA/ARS
- Venganza Research Grant
- KSU Post Harvest Innovation Lab
- Purdue Food Processing Innovation Lab
- MPI: AflaSTOP Post Harvest Storage Structures
- Africa Bureau: Regional EA for Aflasafe
USAID Aflatoxin Summary

Key Field Mission Projects

- East Africa Regional Mission (APPEAR)
- Kenya/Ghana/So. Africa (SPS Capacity Building)
- Zambia (Maize/Groundnuts: Biocontrol)
- Mozambique (Maize/Groundnuts: Biocontrol)
- Rwanda (Maize/Cassava: Biocontrol)
- Tanzania (Maize – Prevalence/Markets)
- Malawi (Maize/Groundnuts – Biocontrol)

Key Future Research Drivers

- Partnership with USDA
- Agriculture/Nutrition Linkage
- Technology Scaling Effort (G8 Countries: Ghana, Ethiopia, Mozambique, Tanzania)
- Get evidence base on stunting/leverage Health money
AflaSTOP Program Update

Rex Raimond, Meridian Institute
Sophie Walker, AflaSTOP CoP

11 April 2014
## Project Objectives

AflaSTOP aims to develop and commercialize new technologies for post-harvest storage and drying of staple crops to help prevent and control the spread of aflatoxin.

### Storage
- Establish whether there are storage devices capable of limiting further aflatoxin contamination

### Drying
- Develop commercial drying technology suitable for investment in by smallholder farmers

### Commercialization
- Articulate commercial models to scale up sale of storage and drying devices
Meru: 26th March – 8th April
CONTACT INFO

- Swalker@acdivoca.org
- Rraimond@merid.org
- mhuisenga@usaid.gov
FUNDING ISSUES FOR PHL SECTOR

1. Many inquiries (esp. grains), but low funding levels persist...

2. Reliance on VC “component” approach for PH

3. Reluctance to invest due to dependence on private sector (high losses persist even in DCs)

4. “Increasing” production more compelling than “reducing” loss

5. Donors doubt hyped-up and variable loss estimates

6. Needs: CoPs; public/private sector research collaboration; results oriented” conferences to promote economic advantages of PH mgmt…
PH FUTURE CHALLENGES
(John Lamb, Abt Assoc.)

1. Need more user friendly PH knowledge platforms

2. Long term investment in human, instit., social capital

3. More risk-based assessments (HACCP-type)

4. More decision-support tools for VC actors

5. More adaptive research on predicting results of biotic stress, and SM and BCC
PH FUTURE CHALLENGES

5. Farmers can’t afford to wait for price increases

6. Lack of credit for PH

7. Small-holder resistance to break bad habits and take on risk

8. Lack of drivers, especially incentives in the marketplace, WTP (willingness-to-pay for results of PH upgrades)
Thank you!
(www.feedthefuture.gov)