Nutrition Innovation Labs - Africa & Asia

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Uganda, Nepal, Malawi, Egypt, Bangladesh…
Over-Arching Operational/Policy Research Questions

• How do investments in agriculture achieve measurable impacts in nutrition? **Can impact pathways be empirically measured?**

• Can nutrition governance (**policy processes**) be better understood and measured to improve impact on nutrition?

• What **neglected biological pathways** impede nutrition gains, and how can these be overcome (aflatoxins, water quality/WASH, environmental enteropathy, etc.)
Nutrition Innovation Lab Phase I (2010-2015)


2. **Capacity-building** – support national HICD. *Malawi: Dietetics program at BUNDA/LUANAR; nutrition education and capacity.*

3. **Support global dialogue** – policy analysis, metrics work, frontier research on biological mechanisms.

4. **Mission support** – specific horticulture, aquaculture, aflatoxin, microbiome, program design questions: Bangladesh, Malawi, Egypt, Nepal, Uganda…
Human and Institutional Capacity Building- Malawi

Active collaboration with USAID Malawi, Bunda/ LUANAR, and College of Medicine, Univ. of Malawi

• Development and implementation of the first Dietetics program in Malawi

• Compilation of a food composition table
  – Endorsed by Government of Malawi
  – Work closely with UN FAO

• Bringing nutrition into the College of Medicine curriculum in Malawi
The evidence base on nutrition sensitive agricultural interventions is small:

§ Most studies review a single intervention. Little data allowing meaningful, comparative assessments.

§ No studies compare relative effects on women vs. men.

§ Few studies explain barriers to, incentives for, adoption of new technologies.

§ Fewer still shed light on why interventions did or did not improve nutrition despite productivity gains.
Staples

Commercialization/value chain

Home gardens/ Small ruminants

Protein quality, Env. Enteropathy

Nutrient density/ Diseases: Malaria

Aflatoxin exposure

21 April 2015

Nutrition Innovation Labs Africa & Asia
Aquaculture-Horticulture to Nutrition Platform (Nutrition Innovation Lab Asia)

Research Platform/collaboration in Bangladesh

– Partners include USAID BFS, USAID Bangladesh, Nutrition Innovation Lab, Horticulture Innovation Lab, Aquafish Innovation Lab, World Fish, USAID Spring, Bangladesh Agricultural University

– In country Technical Advisory Committee

– Working around **five USAID programs** active in the FTF Zone of influence
Bangladesh Research Questions (Program and Scaling Relevance)

- **Population level** effect: 0, 1, or 2 or more interventions in **aquaculture or horticulture and nutrition** behaviors, including:
  - Implementing **new technologies** (cool-bots, solar dryers, floating gardens)
  - Outcomes: **income, consumption and nutrition** of Producer households and **Nutrition** of Consumers

- Relationship between public health nutrition, income and consumption outcomes across groups.
In 1990s, Mulanje was poorest District in Malawi. GTZ 1997-2004, integrated programming instituted. In 2011, < 10% are poor, and gains sustained.
Recent review by British Aid (DFID) of quality of published studies on horticulture/aquaculture

<table>
<thead>
<tr>
<th>Total number of studies</th>
<th>Quality assessments</th>
<th>Research design</th>
<th>Geographical coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Home gardening</strong></td>
<td>High: 1</td>
<td>EXP: 0</td>
<td>Sub-Saharan Africa: 7</td>
</tr>
<tr>
<td></td>
<td>Moderate: 7</td>
<td>OBS: 10</td>
<td>Asia: 8</td>
</tr>
<tr>
<td></td>
<td>Low: 7</td>
<td>QEX: 5</td>
<td></td>
</tr>
<tr>
<td><strong>Aquaculture</strong></td>
<td>High: 0</td>
<td>EXP: 0</td>
<td>Bangladesh: 3</td>
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<tr>
<td></td>
<td>Moderate: 4</td>
<td>OBS: 2</td>
<td>Malawi: 1</td>
</tr>
<tr>
<td></td>
<td>Low: 1</td>
<td>QEX: 3</td>
<td>Vietnam: 1</td>
</tr>
</tbody>
</table>

Community Connector Programme

MULTIPLE INTERVENTIONS

- Risk management, Micro-credit Savings
- Essential Nutrition and Health Actions (ENA, EHA)
- Agricultural and post harvest Technologies
- Service Quality
- Gender approaches
- Sectoral coordination

Income, Health Diet Quality

Maternal/Child Nutrition

80,000 households
15 districts of Uganda

21 April 2015

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Fruit & Vegetable Production in Uganda Leads To:
Improved Food Security, Less Anemia

• Surveyed 3,630 households in 6 districts. Ag production, 24 hour food recall, hemoglobin (Hgb), malaria tests/Rx in women 15-49
• F&V production significantly ↑ F&V consumption. (p< 0.01). F&V producing households had less food insecurity, especially the most food insecure. (p<0.05)
• Women living in F&V households had higher Hgbs (p< 0.01) and were ~15% less likely to be anemic.

This biologically plausible pathway links Fruit and Veg production, better food security, and less anemia.

# F&V production: effect on maternal anemia (PSM)

<table>
<thead>
<tr>
<th></th>
<th>F&amp;V Producers</th>
<th>Non-producers</th>
<th>Change (producers vs. non-producers)</th>
<th>t-value and significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin (g/dL)</td>
<td>13.03</td>
<td>12.84</td>
<td>+ 0.19 g/dL</td>
<td>3.34, p &lt; 0.01</td>
</tr>
<tr>
<td>Maternal anemia (%)</td>
<td>21.37%</td>
<td>25.47%</td>
<td>-16.1%</td>
<td>-2.65, p &lt; 0.01</td>
</tr>
<tr>
<td>Mat. anemia, PSM</td>
<td>20.97%</td>
<td>24.29%</td>
<td>-13.7%</td>
<td>-1.70, P &lt; 0.10</td>
</tr>
<tr>
<td>SEVERE ANEMIA, PSM</td>
<td>0.00%</td>
<td>0.36%</td>
<td>-100%</td>
<td>-2.19, p &lt; 0.05</td>
</tr>
<tr>
<td>Moderate anemia, PSM</td>
<td>7.03%</td>
<td>9.54%</td>
<td>-26.3%</td>
<td>-1.97, p &lt; 0.05</td>
</tr>
</tbody>
</table>

A= severe anemia
B=mod. anemia
C=mild anemia

PSM = Propensity Score Matched
Prevalence of Stunting in children

- Chi Square Test: $p=0.018$
- Children who consumed cow’s milk were 38% less likely to be stunted
Livestock/Malaria Linkage

- While children <2 who received milk were 38% less stunted - in households with cattle, the children had an 20-25% ↑ risk of malaria (p< 0.001). Malaria => death, morbidity, stunting, cognitive defects.
- Yet: owning improved cattle enhances income, nutrition, decrease food insecurity (Kabunga 2014).
- We posit peri-domestic cattle support malaria mosquito vectors that do not bite inside households. (So bednets, household spraying don’t affect them).
‘Cattle Corridor’ in Uganda
Data source: USAID Uganda

Biologically plausible pathway from Agriculture to Nutrition (anemia, stunting) mediated by Malaria
ENVIRONMENTAL ENTEROPATHY (EE)

People living in contaminated environments have leaky, chronically inflamed intestines.

EE - Short blunted villi, tissue is infiltrated with inflammatory cells. 15% less protein and 5% less carbohydrate is absorbed. ↑ nutritional needs, bacteria leak into body, leads to anemia. Bad bacteria are likely cause.

Korpe & Petri, Trends in Molecular Medicine June 2012, Vol. 18, No. 6
MYCOTOXINS IN FOOD

HUMAN AND ANIMAL PATHOGENS

MICRO- AND MACRO-NUTRIENTS

PERMEABLE (“LEAKY”) AND INFLAMED GUT

UNHEALTHY INTESTINAL MICROBIOME
MYCOTOXINS IN FOOD

HUMAN AND ANIMAL PATHOGENS

NORMAL GUT – NOT PERMEABLE

HEALTHY INTESTINAL MICROBIOME

MICRO- AND MACRO-NUTRIENTS
Clear synergies with multiple Innovation Labs

- Adequate and diverse diets
- Safe foods
- A sanitary environment
- Enabling policies based on evidence

Lira, Uganda. Child collecting water protected spring
University Illinois/Nutrition Innovation Lab 2013