The Contribution of Agriculture to Nutrition: Thought Experiments and Experimental Thoughts

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Kathmandu, Nepal

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“Chronic malnutrition rates have not declined significantly over the years despite increased income from high value crops.

New approach to resolution of problem is required.”

USAID/Update (Guatemala Portfolio Review 2013)
So what do we do that is evidence-based?

- Scaling up evidence-based targeted interventions: “30 million fewer children under the age five would be stunted... representing a 20% reduction.”
  
  Horton (2010)

- 10 known targeted nutrition interventions “could reduce stunting by 20%.”

  Bhutta et al. (2013) Lancet Series
Doubling per capita income is associated with reduced stunting of **14.8%**.

World Bank (2012)

“**A doubling of per capita income from agriculture** is associated with a **21 percent** reduction in stunting.”

Webb and Block (2012)

*Proceedings of the National Academy of Sciences*
➢ “Up to 43% of observed growth faltering [stunting] can be explained on the basis of ... long-term intestinal lesions.”

Lunn et al. (1991) *Lancet*

➢ 37% of stunting explained by aflatoxin levels.


➢ “Best linear approximation to the true average causal effect of village-level sanitation [on children's height] is likely to be a large fraction of 0.45 (45%).

Spears (2013)
Poverty reduction - 15%
Agriculture income – 22%
WASH/EE – 10-43%
Open Defecation – 23-40%
Aflatoxins - 25-40%
Nutrition interventions – 11-30%
Value chain/diet quality – 20-30%

A thought experiment

15%?
20%?
35%?
25%?
But...

a) Optimal packages for nutrition impact unknown
b) Translation from trials to scale poorly documented
c) Cost-effectiveness of packages unmeasured
Field Trips!

Nutrition Innovation Lab field sites (21+4)
- Johns Hopkins University/NTAG/NARC
- Heifer/Virginia Tech/Tufts
- Harvard/IOM
- Tufts/Suaahara/IOM/HKI

Legend
- Suaahara
- Feed the Future

Sunaula Hazar
Multi-Sector Nutrition Plan
Agriculture-Nutrition Pathways


Household assets and livelihoods

Policy drivers of inequality: land policies, financial policies, infrastructure investments, education policies, empowerment policies for women & SCTs.

Interhousehold inequality in assets, credit, access to public goods & services

Drivers of "taste": culture, location, growth, globalization

Intra-household inequality: gender roles, education, family size, seasonality, religion, SCTs.

Policy drivers of nutrition: health, nutrition, social protection & education

National outcomes

National nutrition outcomes

Health status

Female energy expenditure

Child nutrition outcomes

Mother’s nutrition outcomes

National Level

Household Level

Individual Level

Policy drivers of inequality: land policies, financial policies, infrastructure investments, education policies, empowerment policies for women & SCTs.

Policy drivers of nutrition: health, nutrition, social protection & education

Interacting
socioeconomic factors
(possible leakages)
Crop yields in Nepal and child nutrition (stunting), by district

<table>
<thead>
<tr>
<th>Crop Yields</th>
<th>Child nutritional status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below average</td>
<td></td>
</tr>
<tr>
<td>Below average</td>
<td>34</td>
</tr>
<tr>
<td>Above average</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Shively et al. 2014
### Percentage contribution to total protein

<table>
<thead>
<tr>
<th>Country</th>
<th>Animal Source</th>
<th>Legumes and Pulses</th>
<th>Total Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myanmar</td>
<td>34</td>
<td>15</td>
<td>15.2</td>
</tr>
<tr>
<td>Pakistan</td>
<td>32</td>
<td>5</td>
<td>16.3</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>22</td>
<td>11</td>
<td>15.6</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>17</td>
<td>4</td>
<td>34.0</td>
</tr>
<tr>
<td>India</td>
<td>16</td>
<td>11</td>
<td>27.5</td>
</tr>
<tr>
<td>Nepal</td>
<td>13</td>
<td>9</td>
<td>4.6</td>
</tr>
</tbody>
</table>

Legend:
- **Animal source**: Blue
- **Legumes and pulses**: Red
Policy & program mechanisms

- From Efficacy to Effect: What’s Happening in Between?

- What bundle of agr/WASH/SBCC/value chain activity has real (measurable) impacts on nutrition?

- What combinations work most cost-effectively per unit of nutrition gained?

- Can we empirically measure quality of implementation and governance for nutrition impacts?
Conclusions

➢ Nutrition labs offer unique research platform on which to build

“Cost-efficacy of food and agriculture-based nutrition enhancing interventions has not been rigorously evaluated.”

Pinstrup-Andersen (Nov 2014)  
ICN+22 prep meeting
Many collaborators (Asia and Africa):
Markets

Households and individuals
Income, assets and savings, household composition, human capital, time

Child care practices
Dietary intake of mothers and children
Number and spacing of children
Hygiene and sanitation
Use of preventive and curative health care

Nutrition status
Low birthweight, stunting, underweight, wasting, micronutrient deficiency

Health status

World Bank (2010) *What can we learn from nutrition impact evaluations?* Washington, D.C.
Children below 5 years (n=5,237) by agroecological zone (from left to right, means = -2.27, -2.02, -1.89)

Source: DHS 2006 and Shively (2013)
“The link between income and health is not reliably mechanical.”

“The relationship between population heights [stunting] and income is inconsistent and unreliable.”

Angus Deaton (2007) 
Height, health and development. PNAS
WASH and stunting

“Meta-analysis including 4,627 children identified a ... statistically significant effect of WASH interventions on height-for-age z-score.”

But...“review identified the paucity of rigorous evidence evaluating the effect of WASH interventions on child nutritional status.”

Source: Dangour et al. (2013) Interventions to improve water quality and supply, sanitation and hygiene practices and their effects on child nutrition.
## Nepal policy and program research

<table>
<thead>
<tr>
<th>Level</th>
<th>Institution/Individual</th>
<th>N = 708</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>Policy makers, donors, international non-governmental organizations (NGOs), academics</td>
<td>26</td>
</tr>
<tr>
<td>Regional</td>
<td>Regional Administrator, Ministries of Health, Agriculture, Livestock, Education, Local Development, Water Supply, implementing NGOs</td>
<td>29</td>
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<tr>
<td>District</td>
<td>Departments of Health, Agriculture, Livestock, Education, Local Development, Social Development, implementing NGOs</td>
<td>278</td>
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<tr>
<td>Ilaka</td>
<td>Offices of Health, Agriculture, Livestock, Education, Local Development</td>
<td>79</td>
</tr>
<tr>
<td>Village</td>
<td>VDC Secretaries of Health, Agriculture, Livestock, Education, implementing NGOs</td>
<td>97</td>
</tr>
<tr>
<td>Ward FCHV Representative – Ward Citizen Forum, FCHVs Representative MG, Representative Cooperative/Groups</td>
<td>199</td>
<td></td>
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</tbody>
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Source: Survey data 2013