Integrating nutrition education & agriculture-based small business development leads to improved child growth in rural Ghana

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Take-home message

Interventions that address the local needs for knowledge, skills, and resources result in...

- Improved economic and social status for women
- Improved child nutrition
Series of field activities

2003-2004
Formative research

• Development of a problem model for the constraints to animal source foods (ASF) in children’s foods in Ghana

2004-2009
ENAM project

• Improve households’ access to ASF
• Improve knowledge and skills of caregivers relative to ASF and child nutrition
• Improve nutrition of preschool-aged children
• Enhance local and regional human capacity to address needs for increased ASF

2013-2018
Nutrition Links project

• Harmonize nutrition knowledge across institutional staff, community residents, and caregivers of infants and young children
• Increase women’s income through poultry egg production
• Improve the quality of young children’s diet and nutritional status
• Improve the quality of district support services
# Formative research methods in 3 regions

<table>
<thead>
<tr>
<th>Focus groups/interviews</th>
<th>Tracked sources of ASF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caregivers</td>
<td></td>
</tr>
<tr>
<td>Community workers</td>
<td></td>
</tr>
<tr>
<td>Program managers</td>
<td></td>
</tr>
</tbody>
</table>

**Stakeholders’ workshop**
- Government
- NGO
- Trade associations
Problem model

Inadequate financial services

Seasonality

Processing and storage

Marketing (producer/consumer linkages)

Low income

Pests and diseases

Inadequate skills and knowledge of caregivers

Size of household

Household food allocation practices

Cultural beliefs and attitudes

Low empowerment of caregivers

ASF Availability Accessibility Utilization

Key constraint

Secondary constraint

Indirect
Intervention locations

**ENAM project**

- 3 regions
  - Upper East
  - Brong Ahafo
  - Central

- 12 communities

**Nutrition Links project**

- 1 region
  - Eastern

- 39 communities

Formative research
# Intervention designs

## ENAM project

### Quasi-experimental (Cluster)

- **16 months**

  **Treatment groups:**
  - Group 1: Intervention (6 communities; n=179)
  - Group 2: Internal comparison (group 1 communities; n=142)
  - Group 3: External comparison (6 communities; n=287)

  **Participants**
  - Caregivers and 2- to 5-y olds
  - Two phases (Interv: n=134; n=45)

## Nutrition Links project

### Randomized controlled trial (Cluster)

- **12 months**

  **Treatment groups:**
  - Group 1: Intervention (19 communities; n=287)
  - Group 2: Control (20 communities; n=213)

  **Participants**
  - Caregivers and infants/<18 mo
  - Two phases (Interv: n=194; n=93)
Intervention components

ENAM project

- Nutrition education
- Business education
- Micro-credit loans

Nutrition Links project

- Nutrition education
- Training on agri-business
- Poultry business inputs

Formative research

ENAM

Nutrition Links
ENAM project intervention

Enam = “animal-based products” (Twi)
Enhancing child Nutrition through Animal source food Management
Component 1. Nutrition education

Part of weekly group meeting
Flip charts for group discussion
- Child feeding styles
- Benefits of ASF
- Balanced plate
- Hygiene

Cooking competition
Component 2. Micro-credit loans

Step 1. Selection of income-generating activities (IGA)

Community ➔ ENAM Team ➔ Community

Develop list of IGA

Reviewed IGA suitability

Cash flow analysis

Consensus on IGA to support

Develop support packages for selected IGA

Promotion of selected IGA
Economic activities

- Types supported
  - Fish smoking
  - Fish selling (fish mongering)
  - Poultry egg production
  - Selling of foodstuffs (yams)
  - Selling of cooked foods
  - Processing & sale of foods (shea butter, rice parboiling)
Step 2. Form loan groups & community associations

**Orientation training**

Eligible caregivers of pre-school children (3-5/group)

Loan requirements:
- Group concept
- $50 maximum initially
- Loan cycle (16 wk)
- Repayment weekly
- Savings (10%)
- Education

Future loans require:
- Meeting attendance
- Savings
- Group appraisal

**Group self-selection**

- Solidarity group
- Solidarity group
- Solidarity group

**Village Credit & Savings Association (CSA)**

- CSA leadership
- CSA by-laws
Component 3. Business education

Part of weekly group meeting
Flip charts for group discussion
• Marketing and customer care
• Record keeping
• Financial literacy

Skits on lessons learned
Weekly meetings

- Repay loans
- Build social networks and sense of empowerment
- Address problems
- Provide education

“I know I am doing well and am more successful than other members. I believe in the project. I follow their lessons well and practice most of the things we are taught”.
Nutrition Links project intervention

Building capacity for sustainable livelihoods and health through public-private linkages in agriculture and health systems
Component 1. Nutrition education

Part of weekly group meeting

Education focused on nutritional benefits and use of the following in complementary feeding:

- Eggs
- Produce from home gardens
  - Green leafy vegetables
  - Orange-fleshed sweet potatoes

Cooking demonstrations
Nutrition Links goal included harmonization of nutrition education throughout the district.
Additional nutrition education activities

At district level
- Government & private industry staff training
- District-wide radio program (post-intervention)

At community level
- Food demonstration sessions
Component 2. Poultry business inputs

_Passing-on-the-gift community development approach (Heifer)_

Gift
- **Home garden cuttings/seeds**
  - Vegetables
  - Orange-fleshed sweet potatoes

Loan (repaid in-kind)
- Poultry
  - Coop roofing
- Poultry
  - 30-40 layers
  - Feed
  - Medication
Component 3. Training on agri-business

Initial training & informally supported in weekly meetings

Processing & marketing

- Eggs
- Garden produce
- Honey (phase 1)

Record keeping

Egg bulking

Technical assistance in the community

Demonstration garden visits at the UG Nutrition Research and Training Centre

Encouragement of savings from sales
Weekly meetings

- Repay in-kind (eggs monetarized)
- Build social networks and sense of empowerment
- Address any production problems
- Provide education
### Baseline results comparing study groups

**ENAM**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Intervention</th>
<th>Internal comparison</th>
<th>External comparison</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Household</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High food insecure</td>
<td>25%</td>
<td>30%</td>
<td>37%</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Caregiver</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Migrant</td>
<td>53%</td>
<td>68%</td>
<td>47%</td>
<td>0.001</td>
</tr>
<tr>
<td>Trader</td>
<td>77%</td>
<td>56%</td>
<td>38%</td>
<td>0.001</td>
</tr>
<tr>
<td>GHc/wk</td>
<td>6.0(0,12.0)</td>
<td>3.5(0,10.5)</td>
<td>3.0(0,11.0)</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Child</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (mo)</td>
<td>38.8(10.4)</td>
<td>43.1(11.3)</td>
<td>43.6(12.2)</td>
<td>0.001</td>
</tr>
<tr>
<td>Weight-for-age, Z</td>
<td>-0.84(0.96)</td>
<td>-0.95(0.97)</td>
<td>-1.06(0.97)</td>
<td>0.05</td>
</tr>
<tr>
<td>Height-for-age, Z</td>
<td>-1.32(1.38)</td>
<td>-1.34(1.15)</td>
<td>-1.43(1.21)</td>
<td>0.62</td>
</tr>
<tr>
<td>ASF diversity, #</td>
<td>5.1(2.0)</td>
<td>4.6(2.2)</td>
<td>4.7(2.2)</td>
<td>0.04</td>
</tr>
<tr>
<td>ASF(#/wk)</td>
<td>15.2(7.1)</td>
<td>14.0(7.7)</td>
<td>12.7(7.0)</td>
<td>0.001</td>
</tr>
</tbody>
</table>
Baseline results comparing study groups

**Nutrition Links**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Intervention</th>
<th>Control</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Household</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low wealth</td>
<td>33%</td>
<td>33%</td>
<td>0.93</td>
</tr>
<tr>
<td><strong>Caregiver</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>25%</td>
<td>19%</td>
<td>0.17</td>
</tr>
<tr>
<td><strong>Child</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (mo)</td>
<td>10.5(5.2)</td>
<td>10.4(5.1)</td>
<td>0.85</td>
</tr>
<tr>
<td>Weight-for-age, Z</td>
<td>-0.78(1.12)</td>
<td>-0.68(1.27)</td>
<td>0.34</td>
</tr>
<tr>
<td>Length-for-age, Z</td>
<td>-0.88(1.27)</td>
<td>-0.78(1.30)</td>
<td>0.39</td>
</tr>
<tr>
<td>Minimal diverse diet</td>
<td>31%</td>
<td>34%</td>
<td>0.55</td>
</tr>
<tr>
<td>Eggs in past week</td>
<td>25%</td>
<td>22%</td>
<td>0.38</td>
</tr>
</tbody>
</table>
## Results

### Difference in diet indicators, intervention

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Intervention difference</th>
<th>$p$ or (95% CI)</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household ASF consumption last week (monetized purchased + not purchased)</td>
<td>+ 5.1 USD (14.8 vs 9.7)</td>
<td>0.001</td>
<td>ENAM$^1$</td>
</tr>
<tr>
<td>Increased cultivation of promoted dark green leafy vegetables</td>
<td>+ 10 % pts (27% vs 17%)</td>
<td>0.05</td>
<td>NL</td>
</tr>
<tr>
<td>Cultivated at least one nutrient-rich promoted crop</td>
<td>aOR=2.11 (1.43, 3.10)</td>
<td></td>
<td>NL</td>
</tr>
<tr>
<td>Child consumed egg in last 24 h (only those with inputs)</td>
<td>aOR=1.59 (0.98, 2.59)</td>
<td></td>
<td>NL$^2$</td>
</tr>
<tr>
<td>Child had a minimally diverse diet ($\geq$4 food groups)</td>
<td>aOR=1.65 (1.02, 2.69)</td>
<td></td>
<td>NL$^2$</td>
</tr>
</tbody>
</table>

$^1$ Homiah PA et al. *AJFAND* 2012; $^2$ Marquis et al. *Matern Child Nutr* 2018

Food groups: grains; roots and tubers; legumes and nuts; dairy products; flesh foods; eggs; vitamin-A-rich fruits and vegetables; and other fruits and vegetables (World Health Organization 2008). NL: Nutrition Links
## Results
### Difference in diet indicators, other predictors

<table>
<thead>
<tr>
<th>Other factors / Indicator</th>
<th>Difference</th>
<th>p</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caregiver has ASF-related business</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASF consumed by child last 7 d, # times</td>
<td>$b = +0.5$</td>
<td>$&lt;0.01$</td>
<td>ENAM$^1$</td>
</tr>
<tr>
<td>Caregiver’s nutrition knowledge/attitudes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASF consumed by child last 7 d, # times</td>
<td>$b = +0.24 (0.08)$</td>
<td>$&lt;0.01$</td>
<td>ENAM$^2$</td>
</tr>
<tr>
<td>Child’s ASF diversity last 7 d, # types</td>
<td>$b = +0.51 (0.02)$</td>
<td>$&lt;0.001$</td>
<td>ENAM$^2$</td>
</tr>
<tr>
<td>Household dietary diversity last 7 d, # types</td>
<td>$b = +0.13 (0.04)$</td>
<td>$&lt;0.01$</td>
<td>ENAM$^2$</td>
</tr>
</tbody>
</table>


ASF types: livestock meats, organ meats/offal, game animals, whole fish, fish powder, shellfish, snails, poultry, eggs, milk/milk products
Women’s voices on children’s diets

“Before the project, I would sell all the fish because I wanted the money. But now, I make sure there is always some fish left at home for them [the children]”

(project participant, ENAM)

“Because of [the garden] we did not eat only one-way food. Mmm [smiling] like eating banku every day, eating banku everyday, we don’t eat like that. [smiling]”

(project participant, Nutrition Links)
## Results

### Difference in nutritional status indicators, intervention

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Intervention difference</th>
<th>P or (95% CI)</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight-for-age, Z score</td>
<td>+0.28</td>
<td>0.05</td>
<td>ENAM¹</td>
</tr>
<tr>
<td></td>
<td>+0.15</td>
<td>(0.00, 0.30)</td>
<td>NL²</td>
</tr>
<tr>
<td>Height-for-age, Z score</td>
<td>+0.19</td>
<td>0.05</td>
<td>ENAM¹</td>
</tr>
<tr>
<td></td>
<td>+0.22</td>
<td>(0.09, 0.34)</td>
<td>NL²</td>
</tr>
</tbody>
</table>

NL: Nutrition Links
### Results: Difference in nutritional status indicators, other predictors

<table>
<thead>
<tr>
<th>Other factor/Indicator</th>
<th>Difference</th>
<th>( p )</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Household children &lt; 5 y, #</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight-for-age, ( Z )</td>
<td>( b = -0.11 ) (0.05)</td>
<td>&lt;0.05</td>
<td>ENAM(^1)</td>
</tr>
<tr>
<td>Height-for-age, ( Z )</td>
<td>( b = -0.22 ) (0.06)</td>
<td>&lt;0.05</td>
<td>ENAM(^1)</td>
</tr>
<tr>
<td><strong>Mother (migrant)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight-for-age, ( Z )</td>
<td>( b = -0.15 ) (0.06)</td>
<td>&lt;0.05</td>
<td>NL(^2)</td>
</tr>
<tr>
<td>Height-for-age, ( Z )</td>
<td>( b = -0.18 ) (0.05)</td>
<td>&lt;0.01</td>
<td>NL(^2)</td>
</tr>
<tr>
<td><strong>Male child</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height-for-age, ( Z )</td>
<td>difference = -0.28</td>
<td>&lt;0.01</td>
<td>ENAM(^1)</td>
</tr>
<tr>
<td></td>
<td>( b = +0.19 ) (0.04)</td>
<td>&lt;0.01</td>
<td>NL(^2)</td>
</tr>
<tr>
<td><strong>Ecological region (Forest Transition vs Guinea Savannah)</strong></td>
<td>Difference = -0.29</td>
<td>&lt;0.05</td>
<td>ENAM(^1)</td>
</tr>
</tbody>
</table>


\(^1\) Marquis et al. *J Nutr* 2015; \(^2\) Marquis et al. *Matern Child Nutr* 2018

NL: Nutrition Links
Common project components

- Outcome of interest was child nutrition
- Rural women with young children
- Activities based on formative research & lessons learned
- Meetings weekly
- Group dynamics for education; reinforced
- Agricultural training in the community
- Inputs or cash included
- Assistance with markets
In summary,

Interventions that provide women with training, economic resources, and social support can help women build agriculture-based small businesses.

Children’s intake of ASF is linked to the mother having an ASF-based business and having the nutrition knowledge about appropriate complementary feeding.

Together, interventions that address knowledge and resource gaps contribute to improving child growth.
The frequent social interactions also improves the lives of women who report ...
• improved relationships with customers and others
• public speaking and teaching abilities
• enhanced self-confidence
• perceived independence and value (I have a voice now)
ENAM

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University of Ghana
O Sakyi-Dawson, A Lartey, B Ahunu,
E Canacoo

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University of Ghana: E Colecraft, R Aryeetey
World Vision International: B Aidam
World Vision Ghana: R Owusu
Heifer Ghana: R Kanlisi
Farm Radio International: B Fiafor

Steering Committee
Traditional leaders, district-level
government representatives, rural bank
representative, community representatives,
& project staff
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