Case study of an agriculture intervention for subsistence farming families in Panama

Rachel Krause¹, Odalis Sinisterra², Kristine Koski³, and Marilyn Scott¹

¹Institute of Parasitology, McGill University, ²Panama Ministry of Health, ³School of Dietetics and Human Nutrition, McGill University
Study Household Characteristics

- 238 families, 309 preschool children
- $8 / mo per capita
- 5% homes with electricity
- 64% with outdoor faucet, 81% with pit latrine
- Stunting ≈ 50% of children
- Intestinal parasites endemic
Subsistence Farming in Rural Panama
VERASAN Food Security Intervention

VERaguas Agriculture, health (SAlud) and Nutrition

Objective: increase agricultural production, to improve food security and child growth

Learning vegetable cultivation, making *bocashi* fertilizer, soil conservation

Harvest from demonstration garden

Nutrition & hygiene workshops
Environmentally-Transmitted Parasites

- Enter environment with fecal material
- Develop in warm, moist soil
- Transmitted through contact with soil
- Stunt growth and cognitive development in preschool in children
1. Has VERASAN increased household agriculture practices and production?

2. Has VERASAN increased household agriculture production and improved food security?

3. Has VERASAN increased agriculture and improved food security improved child diets?

4. Has intensified agriculture increased infections?

5. How has child growth been impacted by changes in child nutrition and infection?
VEARASAN has Increased Household Agriculture Knowledge

Barrier to agriculture: not enough knowledge

- 0 years
- 1 year
- 5 years

Learned in VERASAN

Learned and Used
VERASAN has Increased Household Production and Intensity

**Barrier to agriculture: not enough land**

**Greater Diversity of Crops After VERASAN**

<table>
<thead>
<tr>
<th>Crops Types</th>
<th>0 Years</th>
<th>1 Year</th>
<th>5 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grains &amp; Starches</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**More Rice Harvested After VERASAN**

<table>
<thead>
<tr>
<th>Lbs Harvested</th>
<th>0 Years</th>
<th>1 Year</th>
<th>5 Years</th>
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- a, b, ab indicate significant differences at the 0.05 level.
Experience-Based Household Food Security Questionnaire

- Secure (11%)
- Mildly Insecure (73%)
- Moderately Insecure (11%)
- Severely Insecure (5%)

Percent of Households

- Lack money to purchase food
- Difficulty growing food because of weather, lack of materials
- Decrease quantity or number of meals
- Feelings of hunger (remain hungry after eating or go to bed hungry)

Food Insecurity Score

0 1 14 28 42
Food Security Depends on Income, Long-Term Wealth and Agriculture

Household Food Security Increased by:

- **Recent Income**: Food Insecurity Score decreases as Per Capita Monthly Income increases, with a p-value of 0.038.

- **Long-Term Wealth**: Food Insecurity Score decreases as Household Wealth Index increases, with a p-value of 0.033.

- **Growing More Rice**: Food Insecurity Score decreases as the amount of Rice planted increases, with a p-value of 0.025.
Diet Diversity Score = sum of food groups consumed over 7 days

Child Diet Composition

Least Diverse Diet
- Grains and staples (rice, maize, yucca, plantain)
- Beans and lentils
- Dairy, meat, fish, eggs

Most Diverse Diet
- Grains and staples (rice, maize, yucca, plantain)
- Beans and lentils
- Dairy, meat, fish, eggs
- Citrus fruits
- Vitamin A-rich fruits and vegetables (mango, papaya, carrots, pumpkin, leafy green vegetables)
VERASAN, Agriculture and Mothers’ Activities Affect Child Diet Diversity

Diet Diversity increased by:

Vegetables from VERASAN

\[ p = 0.029 \]

More Types of Crops Grown at Home

\[ p = 0.0001 \]

Diet Diversity Decreased by:

Caregiver Worked in Plot

\[ p = 0.025 \]
Impact of Household Agricultural Practices, Exposure on Infection

- Household food security
- Child diet
- Child growth
- Intestinal parasite infection

VERASAN Agriculture intervention

Intensified household agriculture

+ + + +
Exposure to Agriculture, Increased Agricultural Practices Led to Infections

Ascaris

Prevalence: 16%

<table>
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<tr>
<th>Factor</th>
<th>Prevalence Increase</th>
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<tr>
<td>Caregiver works in agriculture plot (hr/wk)</td>
<td>↑</td>
</tr>
<tr>
<td>Child goes to agriculture plot</td>
<td>↑</td>
</tr>
<tr>
<td>Number of agricultural methods used</td>
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Exposure to Agriculture, Increased Agricultural Practices Led to Infections

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<tr>
<th>Prevalence:</th>
<th>Ascaris</th>
<th>Hookworm</th>
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<td>↑</td>
<td></td>
</tr>
<tr>
<td>Size of agriculture plot (ha)</td>
<td></td>
<td>↓</td>
</tr>
</tbody>
</table>
Child Growth Stunting

Stunting (50%)

% Preschool Children

Height-for-age z-score

0% 5% 10% 15% 20%

-4 -3 -2 -1 0 1
Nutritional Gains in Child Growth are Diminished by Infection

Growth Increased by:

Lower Food Insecurity

Growth Diminished by:

Hookworm Infection

Child Goes to Agriculture Plot

Height-for-Age z-score

Household Food Insecurity Score

p = 0.005

p = 0.035

p = 0.046

p = 0.035
Conclusions and Implications

• Success in increasing agricultural knowledge, production, intensity

• Food security through agriculture and cash – importance of cash crops

• Caregivers’ agriculture work decreases children’s diets and increases infections

• Child exposure to agriculture increases infections and decreases growth

• Attention to child intestinal infections will increase effectiveness of interventions

• Policy: multi-sector approach is needed
Acknowledgements

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Panama Ministry of Agricultural Development
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Staff of the VERASAN program
Families who participated in the study
Questions?
¿Preguntas?
Height and Weight for Age Were Unaffected by Years in VERASAN
Household Agriculture Practices

**Low Activity:**
- Direct planting
- Raising and planting seedlings

**High Activity:**
- Living and stone barriers
- Vegetable and tuber seed selection
- Seed recycling
- Raising and planting seedlings
- Staking vines
- Mulching
- Manure
- Synthetic fertilizer
- Chemical insecticide, fungicide, herbicide
Could Agriculture be a Source of Infection?

Ascaris lumbricoides

Development in the SOIL

Hookworm