Towards a Model for Food and Nutrition Security in CARICOM: A Case study in St. Kitts-Nevis

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CONCEPTUAL FRAME FOR AGRICULTURAL DEVELOPMENT AND FOOD & NUTRITION SECURITY

Steady supply of nutritious produce
Food procurement policy
Food safety inspection
Curtailment of sugary drinks & school vendors

School Feeding & Market Development

Record keeping

Community food security
School menu cost efficiency
Improved farmer livelihood
Community health & development

Training of personal
• Equipping small holder farmers with sustainable agricultural technologies; technology adoption by farmers

• Strengthening markets & mechanisms for produce procurement

• Investments in and strengthening School Feeding Programmes

• Institutions, Knowledge flows, Social capital & policy incidence

• Acceleration of technical and institutional capacity
Populating the model with experimental data:

- agricultural technology for crop productivity and diversity on small holder farms
Drip + mulching

Mulato grass conservation for small ruminants

Drip irrigation

Protected agriculture

Post-harvest loss measurement (Penetrometer)

Innovations: Technologies for diet diversity and quality
2012/2013 Crop yield at St.Kitts project sites

2012 Crop yield at Black Bush Polder (Guyana) project site
Achievement: Increased crop availability and diversity
Achievement: Post-harvest Losses
Mapping for process control

**Achievement: Post-harvest Losses**

**Mapping for process control**

- **Subsistence Farmers**
  - Limited farming experience
  - 16 - 30% Loss
  - Inappropriate on-farm storage and handling and limited markets

- **Commercial Farmers**
  - Advanced farming experience
  - 5 - 20% Loss
  - Limited markets

- **Retailers (Street Markets)**
  - 27 - 38% Loss
  - Non refrigerated storage Environmental factors (T, Light, RH)

- **Retailers (Supermarkets)**
  - 5 - 17% Loss
  - Refrigerated storage Do not meet the supermarket standards

- **Regular Consumers**
  - 1 - 5% Loss

- **School Meal Center**
  - Consumers: Children
Small ruminant performance with Mulato grass silage on farms in St. Kitts

Daily gain (96 d after weaning) of sheep supplemented with Mulato grass silage in St. Kitts.

Control (natural pasture) | Natural pasture + Mulato grass silage
--- | ---
ADG (g/day) | 49 | 57
Populating the model with experimental data:

- Institutions, Knowledge flows, Social capital & policy incidence
- Capacity Building/gender equity /environmental sustainability
Analysis of social network to understand social capital, social learning and knowledge flows among farming communities.

- Strong evidence of social learning among farming communities
- Differences in “relationship ties” linked to innovation and change
Water sampling

Laboratory analysis

Training and field measurements

Soil sampling

Food Safety training
Populating the model with experimental data:

- Local produce procurement
Extent of produce supplied by Local Farmers (Project and Non Project Farmer) in St. Kitts relative to School Meal Centre Needs - 2013 school year

<table>
<thead>
<tr>
<th>Product</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomato</td>
<td>26</td>
<td></td>
<td>19%</td>
<td></td>
<td>83%</td>
<td>surplus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pumpkin</td>
<td>19</td>
<td>0</td>
<td>23</td>
<td>45</td>
<td>62</td>
<td>88</td>
<td></td>
<td>25</td>
<td>72</td>
<td>97</td>
</tr>
<tr>
<td>Cucumber</td>
<td>63</td>
<td></td>
<td>33%</td>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td>14%</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>String Beans</td>
<td>43</td>
<td>33</td>
<td>41</td>
<td>8</td>
<td>33</td>
<td>20</td>
<td></td>
<td>15</td>
<td>0</td>
<td>53</td>
</tr>
<tr>
<td>Carrots</td>
<td>8</td>
<td>25</td>
<td>5% surplus</td>
<td>33</td>
<td>14%</td>
<td>surplus</td>
<td></td>
<td>92</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>73</td>
<td>0</td>
<td>33</td>
<td>0</td>
<td>19</td>
<td>35</td>
<td></td>
<td>19</td>
<td>58</td>
<td>59</td>
</tr>
<tr>
<td>White Potato</td>
<td>0</td>
<td>29</td>
<td>31</td>
<td>60</td>
<td>14</td>
<td>0</td>
<td></td>
<td>0</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Cabbage</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>92</td>
<td>0</td>
<td></td>
<td>0</td>
<td>23</td>
<td>93</td>
</tr>
<tr>
<td>Watermelon</td>
<td>0</td>
<td>0</td>
<td>21</td>
<td>14</td>
<td>79</td>
<td>26</td>
<td></td>
<td>25</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Cantaloupe</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>26</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Banana</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>7</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>Other fruits</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>0</td>
<td>13</td>
<td>53</td>
</tr>
<tr>
<td>Mutton</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Extent of supplied (%)

- 0-25
- 26-50
- 51-70
- 76-100
- Surplus
Proportion (%) of produce supplied to St. Kitts School Meals Centre (SMC) by local farmers ("project" and non-project farmers) in relation to SMC needs - 2013 school year

<table>
<thead>
<tr>
<th>% of Produce supplied</th>
<th>Fruits</th>
<th>Vegetables</th>
<th>Pulses</th>
<th>Roots</th>
<th>Mutton</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL YEAR</td>
<td>11</td>
<td>43</td>
<td>29</td>
<td>45</td>
<td>2</td>
</tr>
</tbody>
</table>

Roots – White potato, Sweet potato and Carrots; Vegetables – Tomato, Pumpkin, Cucumber, and Cabbage; Pulses – String beans; Fruits – Watermelon, Banana, Cantaloupe, Banana, Oranges, and Star fruit; Mutton
Proportion (%) of produce supplied to St. Kitts School Meals Centre (SMC) by local farmers ("project" and non-project farmers) in relation to SMC needs-2013 school year.

Roots – White potato, Sweet potato and Carrots; Vegetables – Tomato, Pumpkin, Cucumber, and Cabbage; Pulses – String beans; Fruits – Watermelon, Banana, Cantaloupe, Banana, Oranges, and Star fruit; Mutton
Total quantity of all produce (Fruits, Vegetables, Pulses, Roots and Mutton) received by St. Kitts School Meals Centre from local farmers ("project" and non project farmers) – 2013 school year

![Graph showing the total quantity of produce received by St. Kitts School Meals Centre from local farmers ("Project" and non Project farmers) during the school year 2013. The graph displays the quantity of produce received in each month from January to December, showing fluctuations throughout the year.]
Total quantity of fruits received by St. Kitts School Meals Centre from local farmers ("Project "and non project farmers) – 2013 school year
Total quantity of vegetables, pulses and roots received by St. Kitts School Meals Centre from local farmers ("Project " and non-project farmers) - school year 2013
Diversity (number) of Fruits, Vegetables, Pulses and Roots received by St. Kitts School Meals Centre from local farmers ("Project" and Non Project Farmers) - school year 2013

![Bar chart showing the diversity of fruits, vegetables, pulses, and roots received by St. Kitts School Meals Centre from local farmers ("Project" and Non Project Farmers) during the school year 2013. The chart displays the number of different items received each month, with blue bars representing all farmers and red bars representing project farmers. The highest diversity is seen in November with 11 different items, followed by September with 8 different items, and the lowest diversity in January with 4 different items.]
Diversity (number) of Fruits received by St. Kitts School Meals Centre from local farmers ("Project" and non Project farmers)- 2013 school year
Diversity (number) of Vegetables, Pulses and Roots received by St. Kitts School Meals Centre from local farmers ("Project" and non Project farmers)- 2013 school year
Produce procurement by SMC in St. Kitts

Contribution (%) of Local Farmers and Supermarket to produce procured by SMC in St. Kitts - 2013

- **JAN**: Farmer 58, Supermarket 42
- **FEB**: Farmer 43, Supermarket 57
- **MAR**: Farmer 14
- **APR**: Farmer 96, Supermarket 4
- **MAY (only one week)**: Farmer 98, Supermarket 2

Legend:
- Farmer
- Supermarket
Populating the model with experimental data:

- School Lunch Feeding
School Feeding data Collected in St. Kitts

- **Total cost of the lunch menu** (two-week sampling in April and September 2013)

- **Food item procurement:**
  - % of food items (F&V) needs at the School Meals Centre supplied locally by local Farmers (project vs Non-Project farmers)
  - % of food items (F&V) needs at the School Meals Centre supplied by supermarkets

- **Diet Diversity:**
  - Number of different fruits and vegetables procured weekly
  - Quantity of different fruits and vegetables procured weekly

- **Diet Quality:**
  - Nutrient composition of meals as offered
  - Acceptability of food items by school children (plate waste: 0-25%; 25-50%; 50-75%; 75-100)

- **Nutrition outcomes of children**
  - 24 h recall dietary intake
  - Fruit and vegetable intake
  - Anthropometry (BMI; height)
  - Blood Hb
The Challenge: Fruits & vegetables

Servings per day

Fruits (Caribbean food group) | Vegetables (Caribbean food group)
--- | ---
SKN: 1.34 | TT: 0.6
SKN: 1.03 | TT: 0.8
BMI of subjects in St. Kitts
Before
- Rice and beans, turkey wings, Noodles/ground meat
- Hot dogs
- Chicken soup with pumpkin and dumplings
- Cheese sandwich
- Sugar drink

After
- String beans, carrots
- Tomatoes, cucumbers
- Sweet potato, pumpkin
- Melon, green banana
- Mutton

<table>
<thead>
<tr>
<th>Number of children impacted by menu change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of meals served daily (national level)</td>
</tr>
<tr>
<td>Number of modified meals served daily (project level)</td>
</tr>
<tr>
<td>Number of children evaluated</td>
</tr>
</tbody>
</table>
Calorie intake (Kcal/child/d/lunch meal) by school children in St. Kitts

<table>
<thead>
<tr>
<th>Calories (Kcal)</th>
<th>Control Schools</th>
<th>Intervention Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>319</td>
<td>391</td>
</tr>
</tbody>
</table>

Nutrient intake (g/child/d/lunch meal) by school children in St. Kitts

<table>
<thead>
<tr>
<th>Protein (g)</th>
<th>Carbohydrates (g)</th>
<th>Fiber (g)</th>
<th>Fat (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>47</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>27</td>
<td>44</td>
<td>3</td>
<td>11</td>
</tr>
</tbody>
</table>

Vitamin intake (per child/d/lunch meal) by school children in St. Kitts

<table>
<thead>
<tr>
<th>Vitamin A (IU)</th>
<th>Vitamin C (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1078</td>
<td>4</td>
</tr>
<tr>
<td>2307</td>
<td>12</td>
</tr>
</tbody>
</table>
Conclusions

- Introduction of drip irrigation technology on small holder farms in St. Kitts resulted in major increases in vegetable and fruit production, with improvements of up to 230, 209 and 770% for tomato, string beans and pumpkin, respectively.

- Throughout the 2013 school year, local farmers delivered 12,746 kg of new produce to the SFP, a novelty in food procurement by the SFP.

- A major project achievement was the substantial improvement in diet quality and diversity of the school lunch meal, with first time addition of six new fruits and four new vegetables to the meal and increases in micro-nutrient content.

- Direct research measurements on the food supply chain revealed that, due to inappropriate storage and handling conditions, unstructured markets plus environmental factors, post harvest losses in St. Kitts were 30% on farms, and about 40% at “street level” markets.

- Forage conservation (silage) technology for dry season feeding of mulatto grass to sheep and goats enhanced small ruminant productivity on small holder farms but the output of mutton fell far short of the SFP needs or school lunch.

- Despite major improvements in year-round crop productivity and diversity, the supply of produce fell short of the SFP needs for a healthy lunch; this was due to seasonality in production and challenges in food procurement mechanisms.

- Improvements in child nutrition and adoption of a “home grown school feeding and farm to fork model” in the Caribbean would require profound and sustainable institutional changes.

- Completion of a community-based farm to fork food security model would require building on existing project findings and upscaling the model, nationally and regionally, to embrace the concept of community and market development.

- Findings from the Project could inform policy makers of the utility of the farm to fork model for regional application in CARICOM.
Acknowledgements

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THANK YOU