Fighting malnutrition with Moringa oleifera leaves: an untapped resource
Dr de St Sauveur, A.; Dr Broin, M., MORINGANEWS
Moringa in India: a fruit industry
Moringa stenopetala leaves are a staple food for the Konso people in Ethiopia

Photos E. Demeuleunaere
Moringa leaf in Africa: a secondary food

Fresh Moringa leaf seller in Togo

Balls of cooked Moringa leaves in Ghana

Moringa and other highly nutritious plant resources: Strategies, standards and markets for a better impact on nutrition in Africa. Accra, Ghana, November 16-18, 2006
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Moringa is easy to grow and to process into powder
Moringa is getting popular in NGO projects fighting malnutrition

Building awareness in Togo

NGOs need information on the nutritional value and dosage of the powder

Leaf drying on nets
Using Moringa leaf powder as a source of proteins and micronutrients in baby foods

- To calculate these formulas, we took into account the needs of children aged 6 months to 2 years (on a mixed diet of solid foods and maternal milk) as defined by the WHO.

- We calculated the average nutritional value of Moringa leaf powder from various analysis results.

- We chose other ingredients widely available in Africa.
Using Moringa leaf powder as a source of proteins and micronutrients in baby foods (continued)

- The formulas were calculated using the **Alicom software**, developed by the Tropical Nutrition Laboratory of the Institute for Research and Development (IRD) in Montpellier, France. It calculates both nutritional values and costs.

- We also included results from **sensory tests** done with mothers and children in Togo (Univ. of Lomé) and in Burkina Faso (IRD). These tests showed that formulas containing up to 15% of Moringa leaf powder were accepted.
## Baby flour formula n°1

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity (in grammes per 100g of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roasted maize flour</td>
<td>67 g</td>
</tr>
<tr>
<td>Dried Moringa leaf powder</td>
<td>15 g</td>
</tr>
<tr>
<td>Roasted cowpea seed flour</td>
<td>13 g</td>
</tr>
<tr>
<td>Palm oil</td>
<td>5 g</td>
</tr>
<tr>
<td>Salt with iodine and fluoride</td>
<td>0.6 g</td>
</tr>
</tbody>
</table>
## Baby flour formula n°2

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity (in grammes per 100g of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roasted millet flour</td>
<td>60 g</td>
</tr>
<tr>
<td>Dried Moringa leaf powder</td>
<td>16 g</td>
</tr>
<tr>
<td>Roasted soya bean flour</td>
<td>24 g</td>
</tr>
<tr>
<td>Salt with iodine and fluoride</td>
<td>0.6 g</td>
</tr>
</tbody>
</table>
## Baby flour formula n°3

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity (in grammes per 100g of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roasted sorghum flour</td>
<td>30 g</td>
</tr>
<tr>
<td>Roasted soya bean flour</td>
<td>26 g</td>
</tr>
<tr>
<td>Roasted millet flour</td>
<td>24 g</td>
</tr>
<tr>
<td>Dried Moringa leaf powder</td>
<td>10 g</td>
</tr>
<tr>
<td>Sugar</td>
<td>10 g</td>
</tr>
<tr>
<td>Salt with iodine and fluoride</td>
<td>0.6 g</td>
</tr>
</tbody>
</table>
These formulas meet children’s protein, lipid, carbohydrate, essential fatty acid, and most vitamin and mineral needs. They are:

- (i) balanced in macronutrients,
- (ii) rich in micronutrients,
- (iii) produced with inexpensive foods available locally and
- (iv) are a considerable improvement to most local baby foods.
Is it economic to produce Moringa leaf powder by institutions involved in nutrition?

- Projects that attempted to have Moringa leaves produced within health organisations gave up when faced with the inefficiency of this method. Buying directly from the farmer is the better option.
- The issue of production costs was not addressed until very recently as projects distributed the powder for free.
In 2005, we made an initial evaluation of Moringa leaf powder production costs in Benin and in Togo. The figures were collected by the NGOs managing the projects, with a framework provided by Moringanews.

We also obtained data from a completely different system located in northern Senegal: intensive farming using drip irrigation, fertilisers and pesticides, as well as a more elaborate processing system.
1. Intensive production in Senegal (Church World Service/ASREAD)

Harvesting by cutting the whole plant near the ground

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Processing workshop in Senegal

(Church World Service/ASREAD)
Results from Senegal (ASREAD)

- Without including investment costs such as the mill, the pump and the workshop buildings, the production cost of one kilo of powder in this system is 4 €.
- Annual production is high, with 5 tons of powder per hectare and per year. (=100 t of biomass/ha/yr, including branches)
- This is an expensive production system
2. Intercropping by women groups

Benin (GARPE/PEACE CORPS)
Women groups make dried leaf powder in Benin (Garpe/Peace Corps)
Results from Benin (GARPE/PC)

- Yields are low: 130 to 250 kg of powder/ ha/yr (but intercropping)
- Production costs: 2 €/ kilo of powder packaged in plastic bags (but most of this cost is estimated labour costs)
- Women sell the powder in bulk for 1000 FCFA/kg to GARPE, who sells it without making a profit to health structures (hospitals).
- Health structures sell the powder in 100g sachets.
- In the city of Parakou, the powder is sold to individuals at 3000- 4000 FCFA/kg.
3/ Mono-cropping by small farmers in Togo (APPEF-Togo/Moringanews)
Stripping leaves after harvest in Togo
Drying leaves in Togo
Awareness on nutritional benefits in Togo
Results from Togo

- Production costs range from 1€ to 1,83€, depending on yields (620 kg to 1700 kg of powder/ha/yr). This is in bulk.
- 95% of these costs are estimated labour costs, i.e. family labour.
- At 1500 FCFA/kg, the average profit is 641 FCFA/kg, or almost 1€/kg of powder
- Producing Moringa leaf powder can be a very profitable activity for small-scale farmers.
To be accomplished-

- Establish quality standards and control of:
  - Processing (drying and grinding)
  - Storing and packaging
  - Shelf life

- Registration with health and nutrition authorities (Ministry, Dept of nutrition…)
  - Clinical studies needed
  - Bioavailability studies needed
  - Advertise to decision makers and international health organisations
Moringa food supplements can perhaps open the path to nutritional use?

Companies who sell food supplements will have to provide information about the quality and innocuity of the product to register it as a food product or as a medicine. This can help the acceptance of the product by health authorities.