THE SANJANA SOLUTION

Melissa Cheviron
Joshua Gross
Stephan Matei
Cheryl Mukai

http://www.heatherleach.com/garden%20and%20wells%20006.jpg
Research

Source: IIT Bombay Research Team
Original Concept

- Laundry Mechanism (washboard)
- Turbid Water
- Gravel 1.5"
- Sand-Charcoal Mixture 3"
- Fabric
- Top Bucket Support (old bucket handle)
- Clean Water Storage
- Clean Water
However...

- “The cost of sand is roughly Rs 600 per kg, while that of gravel is about Rs 550 per kg” - Srinidhi, IIT Bombay

- Income rarely exceeds 5,000-10,000 Rs ($100-200) per month

- “... look up some natural coagulants that could be useful to clean the laundry water. Some seeds like reetha and drumsticks have been suggested in old Indian texts. They are cheaply and easily available” - Srinidhi, IIT Bombay
What is the Drumstick tree?

*Moringa Oleferia*
- native to India
- does not require much water
- seed takes 2 weeks to sprout
- mature within 8 months
- 2 large harvests a year

A mature tree produces 5,500 seeds a year, which is enough to clean 7,000 liters of water

<table>
<thead>
<tr>
<th></th>
<th>Drumstick</th>
<th>Alum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Coagulant</td>
<td>Chemical Coagulant</td>
<td></td>
</tr>
<tr>
<td>Unaffected by pH</td>
<td>Functions from 7 to 8 p</td>
<td></td>
</tr>
<tr>
<td>80% removal of salt</td>
<td>10% removal of salt</td>
<td></td>
</tr>
<tr>
<td>Antimicrobial</td>
<td>Antimicrobial</td>
<td></td>
</tr>
<tr>
<td>Biofertilizer</td>
<td>Not biodegradable</td>
<td></td>
</tr>
<tr>
<td>Health/Nutritional Benefits</td>
<td>Possible Carcinogen</td>
<td></td>
</tr>
</tbody>
</table>
Laundry Water

Dirt-
  Reduced from 550 FTU to <10 FTU

Soap-
  Sodium Lauryl Sulphate-80% removal

Bacteria-
  Reduction of both gram-negative and gram positive

Sources: T. Okuda et al., Beltrán-Heredia, J et. Al.
Clarified Water

- “there must be some reassurance that the filtered water is of required quality”

Source: http://www.optek.com/images/FTU-NTU_Turbidity.jpg
The Drumstick Tree

Case study: water clarification using *Moringa oleifera* (Drumstick tree)

300 mg of crushed seeds can clean 1L of turbid water (76%)

- Cleared to 4 FTU
- 95 min settling time


Garden-in-a-sack

Done in slums of Nairobi, Kenya

Apply idea in India:
- Plants with short maturity period: spinach, tomatoes
- Long-term: Drumstick Tree

Implementation

Source: http://blog.acarainstitute.org/2009/03/field-notes-from-mumbai-slum-visit.html
Scalability
Initial Seeds

- Seeds contain 40% oil
  - Fragrance Companies
  - Vegetable Oil Manufacturers

  Thermoresistant coagulant protein
  - After extraction still 80% viable
Business Proposal

Incentive:
(assuming 40L water/week for laundry)
- 39L saved/week*4 weeks*.13 Rs/L=20 Rs
- 5Rs/100ml of spinach
- eat Morniga leaves 4 times a weeks instead of spinach:
  - 4 moringa leave servings /week *4 weeks/month * 5 per/ 100mL * 4 people= 320 Rs
- Sell Sachets 10Rs/65 crushed seeds* 6 sachet/month=60Rs
- Each sachet cleans 80L of water
- Savings:
  - 400 Rs
  - Health Benfits

Biggest obstacle: start-up
- Initial investment: ~Rs 1000 (sack, soil, seeds)
- Need micro-financing / NGO support
Sustainability

Self-sustaining closed system
Eco-friendly
Break even within 4 months
Holistic approach
  Water
  People
  Health
Health Benefits

For a toddler, 100g of leaves provides:
100% Calcium, vitamins A & C
75% Iron
50% Protein
Potassium
Vitamin B
Copper
Essential amino acids

Source: Tree for Life http://www.tfljournal.org/article.php/20051201124931586
<table>
<thead>
<tr>
<th></th>
<th>Leaves</th>
<th>Flowers</th>
<th>Seeds</th>
<th>Pods</th>
<th>Roots</th>
<th>Bark</th>
<th>Gum</th>
<th>Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimicrobial</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Asthma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer therapy</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulatory/Endocrine</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Detoxification</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Digestive Disorders</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Inflammation</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Immunity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nervous Disorders</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Nutritional</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Reproductive Health</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Skin Disorders</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>General Disorders</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Source: Fahey, Jed
Thank You

IIT-Bombay
Srinidhi Balasubramanian
Muuna Kumar Shah
Dr. Ravi Gudi
Our Professors:
Professor Linda Pulik
Dr. Kenneth Schug
Dr. Margaret Huyck
ACARA Institute
Cargill
References


Pascal, Peggy."A garden in a sack in the slum" Solidarites, Kenya.


Questions?