FSM Business Models

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Sanitation Service Delivery Chain

Access to Toilet ➔ Emptying ➔ Transport ➔ Treatment ➔ Disposal or Reuse

Desludging ➔ Latrine or septic tank ➔ Sludge drying bed ➔ Co-composting ➔ Blending and Pelletization ➔ Valorization ➔ Reuse

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**Generic Business Model**

**Key Partners**
- Municipal corporation
- Technology suppliers
- Financing entities
- Community Based Organisations

**Key Activities**
- Fecal sludge collection and treatment
- Production and sales of compost
- Biogas production and energy generation
- Customer relationship management
- Interaction with carbon companies

**Value Propositions**
- Improved sanitation service by timely emptying and collection of fecal sludge from pit latrines and septic tanks
- Government certified quality fecal sludge compost as soil ameliorant and improved long term agriculture productivity
- Reliable energy service and improved energy security for the region
- Improved environment and reduced greenhouse gas emissions

**Customer Relationships**
- Personal contact between sanitation service provider and customer and/or legal commitment from the municipality to provide the service
- Personal contact and through network of distributors
- Contractual agreement for sale of energy
- Personal contact

**Customer Segments**
- Households, community, municipality, business and institutions
- Farmers, plantation, nursery, landscaping, real estate, agriculture department, agro-industries, forestry
- Households, community, municipality, business and institutions
- Carbon credit companies

**Key Resources**
- Equipment for: pit emptying, compost production and energy generation
- Labour
- Agreement and contracts for procuring waste

**Channels**
- Direct
- Dealer, distributors and extension agents, fertilizer companies and agro-industries
- Direct or through community based organizations
- Direct interactions

**Cost Structure**
- Investment cost
- Annual operating cost
- Interest payments on borrowed funds

**Revenue Streams**
- Sanitation Service Fees
- Sale of Compost
- Sale of Energy
- Sale of Carbon credits

**Social & Environmental Costs**
- Possible human health risk while handling fecal sludge to the labor and poor sanitation service provided poses health risk to consumers

**Social & Environmental Benefits**
- Reduced pollution of water bodies and human exposure to untreated fecal sludge
- Enhanced soil fertility and productivity
- Improved energy security
- Job creation among the poor

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**Improve Sanitation Service by**

**Collection and Treatment**

**Energy Service**

**and Improved Security**
FSM Business Model Classification

• Broad classification:
  – Toilet Accessibility
    • FSM for Easy to Access Pits
    • FSM for Difficult to Access Pits
  – Institutional FSM Structure
  – FSM Reuse
    • Nutrient Recovery
    • Energy Recovery
Business Model - Institutional: Business as Usual

- Indiscriminate dumping to large extent
- O&M: covered by fee
- Sent to Land fill or can plan for composting

Household
- Capital and O&M
- On-site system construction
- Septage treatment tax
- Desludging
- Latrine or septic tank

Private entrepreneurs
- Emptying charge

Water and Sewerage Utility
- Pre-treatment
- Post-treatment
- Co-composting
- Sludge drying bed
- Blending and Pelletization

Farmer
- Valorization
- Reuse

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Business Model - Institutional: Public or Private

- **Household**
  - WW treatment tax
  - On-site system construction

- **Water and Sewerage Utility**
  - O&M: covered by fee
  - Unscheduled Emptying charge

- **Farmer**
  - Land fill but can plan for co-composting or reuse for increased cost recovery

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Business Model: Institutional Structure – PPP Mix

- **Household**: Sewerage fee collected from water bill
- **CBO and Social Enterprise**: Unschedule d emptying charge
- **Water & Sewerage Utility**: Contracting scheduled desludging, O&M: covered by fees & tax
- **Farmer**: Collects dried sludge

**Indiscriminate dumping to large extent**

- Capital and O&M
- Land fill
- Tipping fees

**Sewerage fee collected from water bill**

**Unschedule d emptying charge**

**Contracting scheduled desludging**

**O&M: covered by fees & tax**

**Land fill**

**Tipping fees**

**Collects dried sludge**

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Reuse Focus

Reuse Business Models

- Soil conditioner
- Irrigation
- Protein production
- Fodder and plants
- Fish and plants
- Building material
- Biofuel

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FS Nutrient Recovery Value Propositions

- **Recovery Value Proposition**
  - **BSFL**: high protein content animal feed + unsaturated fatty acid for food pet food
  - **Carbon Credits**: GHG savings are traded (e.g., composting vs. landfill)
  - **Co-composting** (e.g., with N-rich FS*) for Soil Fertility Enhancement
  - **Composting**: Organic Matter is Returned for Soil Amelioration
  - **GHG Emissions Offset**
  - **Water and Soil Quality**
  - **Yield Increase**
  - **Soil Amelioration**
  - **Protein**
    - Unsaturated Fats

**Safe Disposal** for Environmental and Human Health

**Investment costs and revenue potential**

Source: Otoo & Drechsel 2015, IWMI (forthcoming)
Co-composting Business Model

Solid waste collection fee: 12 ton MSW/day
Charge – USD 0.75 to 9

10 to 12 m3 FS per day
30 USD for desludging

Capital: covered by Central Environmental Authority & Provincial Council
About USD 350K

O&M: $1,340/month

Support by local university and Learn Asia

Co-compost: $3/50 kg bag

Sale of Recyclables Profit $1,800

Latrine or septic tank

Household

Balangoda Municipality

Farmer

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Farmer-Vacuum Truck Operator Partnership

Capital and O&M:
- Indiscriminate dumping to a large extent
- Emptying charge

Public Toilet & Household
- On-site system construction

Private entrepreneurs
- Pre-treatment
- Post-treatment
- Co-composting
- Blending and pelletization
- Reuse

Farmer
- Dumping charge
- Valorization

- Desludging
- Sludge drying bed

Latrine or septic tank

- 3 FS tankers (4.45 m3) per ha ~ $16; Price of 50 kg bag of fertilizer per ha ~ $18
- Treatment: On farm FS treatment by drying. Long drying periods reduces health risks. Rainy season hardly any diversion of FS trucks
- Geographical Location: India, Ghana, Sri Lanka
Reuse of urine as organic fertilizer for agricultural production

- Dry urine-diversion technology adoption particularly in slums
- Value-addition to human waste for sale to farmers
- **Private sector**
- Benefits to poor – slum areas (demand and supply side)
- Demand by farmers in suburbs as ready market for produce

**Cases:** Uganda, South Africa, Kenya, Zimbabwe, Senegal and Burkina Faso
FS Energy Recovery Value Propositions

Source: Otoo & Drechsel 2015, IWMI (forthcoming)
Institutional and Public Toilet, TOSHA, Kenya

- **Household/Users**: 350 to 1000 users per day
- **TOSHA – Community Service (Public Toilet)**: 60,000 kg of feces from 57 centres
- **Enterprise and Farmers**: Potential for sale of compost

**Capital**: $22,500 plus $10,000 for awareness and community mobilisation

**O&M**: $3,720/year

**Rental fees**: $1,800/year

**Savings from Biogas**: $720/year

**Toilet fees**: $1,100 per month
### Nutrient Recovery

<table>
<thead>
<tr>
<th>Business Scale (waste treated)</th>
<th>NUTRIENT RECOVERY</th>
<th>ENERGY RECOVERY</th>
</tr>
</thead>
<tbody>
<tr>
<td>t/d</td>
<td>&lt;0.6</td>
<td>~3.5</td>
</tr>
<tr>
<td>~4000</td>
<td>~3000</td>
<td>~32,000</td>
</tr>
<tr>
<td>&lt;0.5</td>
<td>&lt;0.2 of urine and 0.02 of compost from faeces</td>
<td>&lt;16</td>
</tr>
<tr>
<td>USD</td>
<td>~200k</td>
<td>95k-210k</td>
</tr>
<tr>
<td>USD/yr</td>
<td>70k</td>
<td>15k-20k</td>
</tr>
<tr>
<td>USD/yr</td>
<td>125k</td>
<td>13k-24k</td>
</tr>
<tr>
<td>ha</td>
<td>0.8-1.6</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Source: Otoo & Drechsel 2015, IWMI (forthcoming)

- Assessment based on highly successful reuse cases from Asia, Africa and Latin America
- Reuse Products – Composted Feces, Urine, Co-compost, pelletized co-compost and Biogas
reuse = increased cost recovery

• Reuse products value:
  – Urine: $0.2 /jerry can
  – Compost: $3 to $5 per 50 kg bag
  – Biogas: replacing firewood 6 tons to 40 tons/year – about $25 to $50 per day

• Cost of Investment (treatment for Reuse)
  – Nutrient recovery: $3 and $150 to $250 per HH
  – Energy recovery: above $50 per HH

• O&M Costs:
  – Nutrient recovery: $2 to $7 per HH/month
  – Energy recovery: $2 per HH/month

• FS collection and emptying costs: $1.5 to $8 per HH/month (depending on region)

• Revenue – mostly covers O&M costs plus in some cases some part of collection and emptying costs
# Take Away Message and Next steps

<table>
<thead>
<tr>
<th>Avoid past failure</th>
<th>Incorporate Reuse</th>
<th>Think beyond Sanitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Overreliance on public funding (incl. maintenance)</td>
<td>• In a post – MDG environment, key to look at possible end use of products out from on-site sanitation service delivery</td>
<td>• Feeding the cities – lost nutrients and water</td>
</tr>
<tr>
<td>• Lacking market analysis and business approaches</td>
<td>• Nutrient and energy reuse from on-site sanitation are fairly established</td>
<td>• Green and circular economy (organic nutrients, water reuse and RE)</td>
</tr>
<tr>
<td>• Donor investments target leveraging (local) private sector capital</td>
<td>• Reuse decrease cost and improve sustainability – critical is for reuse product market establishment</td>
<td>• Explore synergies with other sectors (e.g. MSW, Agriculture, Industry etc.)</td>
</tr>
</tbody>
</table>

**Next Steps:** Finalizing the business models, financial assessment and incorporate feedback
Thank you
Co-composting Business Model, Bangladesh

Households

Organic Waste

Dry Faecal Sludge

Filtered Water

Co-composting

COMPOST

Human Excreta

Drying Bed

Dry Faecal Sludge

Filtered Water

Cocoa Pit Filter

Filtered Water

Soak Well

Agriculture

Solid waste collection fee: $0.5/hh/month

Capital: covered by LGED and UNESCAP

O&M: $2,900/month

Co-compost: $130/ton

Support by Waste Concern