FAME RESEARCH: CAN THE SANITATION VALUE CHAIN BE FINANCED WITH INDUSTRIAL REUSE OF FS?

Marie-Alix Prat and Sophie Trémolet
Tremolet Consulting for Hydrophil

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Context and objectives of the study

- **Objectives of the FaME project:** Create end-use faecal sludge management (FSM) solutions that capture and create value from faecal sludge (FS) by producing end-products such as combustible or soil conditioner.

- The **underlying assumption** was that this could provide incentives and cash flow to help drive and finance robust sanitation schemes.

- The project was conducted in 3 cities: Accra, Dakar, and Kampala.

- **Objectives of the Finance «Work Package»**
  - Assess the financial viability of marketing end-use products derived from faecal sludge (FS) treatment:
    - Quantify the volumes of FS produced by on-site sanitation facilities at the different stages of the sanitation value chain.
    - Estimate revenues from the potential sale of FS end-use products.
    - Assess the financial viability of each actor along the sanitation value chain and whether there would be sufficient revenues to finance the service chain.
  - **Propose measures to distribute these potential revenues to the various stakeholders to improve the performance of the sanitation sector.**
Stepped approach

STEP 1 – SCOPING THE ON-SITE SANITATION MARKET

1.1. Understanding the demand side: how many people are served and how
1.2. Understanding the supply side: identifying main stakeholders
1.3. Defining the geographical boundaries of the market

STEP 2 – QUANTIFYING FAECAL SLUDGE PRODUCTION

2.1. Quantifying physical flows along the faecal sludge value chain
2.2. Identifying inefficiencies along the faecal sludge value chain

STEP 3 – ESTIMATING THE POTENTIAL VALUE OF FS REUSE

3.1. Evaluating the interest of potential FS users and estimating a “take-up” price
3.2. Estimating the costs and revenues associated with producing and selling DTFS

STEP 4 – IDENTIFYING THE POTENTIAL DISTRIBUTION OF BENEFITS

4.1. For faecal sludge treatment plant operators
4.2. For transport operators (latrine emptiers)
4.3. For households
4.4. For society as a whole

STEP 5 – RECOMMENDATIONS TO KICK-START THE FS REUSE MARKET
Step 2.1 – Quantify the volumes of FS along the value chain

Sanitation markets in Dakar (volume of FS in m$^3$ per year for

Production 2012)

Estimated annual production (2012): 1,565,911 m$^3$ (-25% /+50%)

On-site sanitation: ~ 1,017,842 m$^3$ (-25% /+50%)

Off-site sanitation

Sewers 35%

Collection

Open defecation ~ 0%

Pit latrines 2%

Septic tanks 58%

Semi-collective (small-bore) 5%

Remains in latrine (10%)

Manual emptiers & others (family)

Transport

Unquantified but potentially large

Mechanical emptiers

218,149 m$^3$

Faecal sludge treatment plants

Wastewater Treatment Plants

Disposal

Burying / unsafe disposal in the neighbourhood

Treated dry FS for end-use sold to industries

Reuse

Treated dry FS for end-use sold to local farmers

Sea outfall

Unquantified but limited (620 m$^3$ in 2008)

Demand to be created
Step 2.2 - Identify the inefficiencies along the value chain

Common inefficiencies identified in Dakar, Kampala and Accra:

**Collection**
- **Poor quality of septic tanks**: Increases the frequency of emptying required and the overall cost for households. The content of the pits is very liquid (in Dakar)

**Transport**
- **Poor quality of equipment used by mechanical emptiers**: A dense layer of (nutrient-rich!) solids remains at the bottom of the tank
- **Unaffordable Services**: Households have to use manual emptying

**Treatment**
- **Illegal FS discharges in the environment**
Step 3 – Estimate the potential end-use value of FS (1)

- Several options for FS end-use were considered in each country, based on a demand assessment and market-testing with potential end-users:
  - **Industrial: fuel in cement production or oil regeneration processes:**
    - The potential purchase price was estimated based on the calorific value of dried FS and that of the fuel currently used (coal).
    - To make FS attractive, the potential price of FS was estimated at 50% of that for coal (in proportion to its calorific value).
    - However: Industries consulted did not express significant interest, as the volumes of FS that could be produced (i.e. treated and dried) were deemed insufficient and irregular. For cement production, it is necessary to make an initial investment to adapt the kilns to use this new type of solid fuel.

  - **Agricultural: use as a natural fertilizer**
    - The purchase price was estimated based on the demand for organic fertilizers and improved production of dried FS. It could be increased if:

<table>
<thead>
<tr>
<th>Price considered for dried FS in :</th>
<th>Fuel</th>
<th>Fertiliser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dakar</td>
<td>USD 59.2 /t</td>
<td>USD 3.6 /t</td>
</tr>
<tr>
<td>Kampala</td>
<td>USD 14.8/t</td>
<td>USD 7.8 /t</td>
</tr>
<tr>
<td>Accra</td>
<td>USD 85.4 /t</td>
<td>n.a</td>
</tr>
</tbody>
</table>
Step 3 – Estimate the potential end-use value of FS (2) – Results from Dakar

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Revenues from industrial end-use</th>
<th>Revenues from agricultural end-use</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. «Business as usual»</td>
<td>USD 0</td>
<td>n.a.</td>
<td>Current inefficiencies in the collection, transport and treatment of FS</td>
</tr>
<tr>
<td>2. Sale of dried FS at the current level of production</td>
<td>USD 90,388/year</td>
<td>USD 5,448/year</td>
<td>Potential revenue if the current volume of FS discharged annually at the treatment plants were treated, allowing them to sell about 1,520 tons of dried FS per year.</td>
</tr>
<tr>
<td>3. Production of FS at maximal capacity + sale</td>
<td>USD 176,378/year</td>
<td>USD 10,631/year</td>
<td>Potential revenues if the treatment plants were receiving and treating FS at their maximal capacity of treatment, allowing them to sell about 2,980 tons of dried FS per year.</td>
</tr>
</tbody>
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- The revenues from selling dried FS as solid fuel could be used to provide financial incentives and increase the performance of the sanitation value chain.
- This should be done gradually and iteratively: Additional revenues depend on the increase of FS volumes and the improvement of the sanitation chain efficiency. We need to create a “virtuous cycle”!
Step 5 – Recommendations to improve the sanitation value chain and production of dried FS for end use

**Collecte**
- **Provide access to credit for households** to construct better quality septic tanks
- Incentivise mechanical emptiers to **reduce the price of emptying** for households, by improving their performance and subsidies

**Transport**
- **Tackle identified inefficiencies of FS collection and transport** to maximize the volume delivered to the FSTPs, by:
  - investing in better quality and more efficient trucks
  - improving the efficiency of their business (e.g. zonation of the city, truck routing or a centralized bidding system through mobile phones)

**Traitement**
- **Reduce the deposit fee** at the treatment stations to incentivise transport of FS to station – potentially pay emptiers to do so
- **Ensure that treatment plants produce dried FS at volumes and quality to supply adequate fuel to identified end users**
Step 5 – Financing the initial measures

- Initial investments to increase FS collection, transport and treatment services need to be financed with public funding or cross-subsidies from other services.

- These subsidies could be replaced with income generated from FS end use, once reliable demand has been established.

- Dried FS could also be provided free of charge to industries during an initial testing phase to encourage them to use dried FS and explore the benefits.
Conclusion

- There is no clearly established demand for dried FS in the cities studied at present. This is partly due to the fact that an insufficient amount of FS is treated for end-use.
- Once the existing treatment plants would produce dried fuel at full capacity with the quality desired by industries, interest on the industrial side could be raised and attractive revenues for the FSM service chain can be generated.
- Public funding could finance initial measures to increase the efficiency of the FS market, such as supporting households to build better designed septic tanks, reducing the dumping fee for mechanical emptiers, or helping them become more efficient.
- Once such a market is established, it could generate in the region of USD 100,000 to + 1,000,000 per year (depending on cities) and provide funding to support functioning of FS markets.
Thank you for your attention!

Marie-Alix PRAT
Marie-alix@tremolet.com
Sophie TREMOLET
Sophie@tremolet.com

Magdalena BÄUERL
Martin EDTHOFER