

# Faecal Sludge – From Waste to Solid Biofuel?

Research in urban areas of Senegal, Ghana and Uganda proved that there are widely untapped markets for faecal sludge end-products as financial drivers to sustain reliable and safe faecal sludge management. As a fuel, it especially shows promise as an industrial energy resource and a means to generate revenue. M. Gold<sup>1</sup>, A. Murray<sup>2</sup>, Ch. Niwagaba<sup>3</sup>, S. Niang<sup>4</sup>, L. Strande<sup>1</sup>

## Introduction

Urban sanitation throughout Sub-Saharan Africa is characterized by poorly designed and maintained on-site sanitation systems, dysfunctional faecal sludge collection and transport, and unsafe disposal of untreated or inadequately treated faecal sludge into the environment. The SPLASH funded research project Faecal Management Enterprises (FaME) aims to improve dysfunctional sanitation chains by developing scalable reuse oriented value chains, changing faecal sludge management from a disposal problem into a profitable business. The goal of FaME research is fill the data gaps about the use of faecal sludge that limit scientific decision making and market implementation.

## Market demand for faecal sludge

In collaboration with local partners, market demand studies, comprising of focus group discussions and interviews, were conducted with potential faecal sludge end-users in Dakar, Kampala, and Accra to identify possible markets for five faecal sludge end products. The products are: an industrial fuel, as a source to produce protein for animal feed, as a source to produce biogas, a component in building materials, and a soil conditioner or fertilizer. Already used to some extent as a soil conditioner in these locations, the end-products represent po-

tentially sound revenue generating sources. Their market potential, however, depends on local factors, such as the faecal sludge characteristics, existing markets, local industry requirements, legal regulations, subsidies, and locally available materials [1].

## Co-combustion of faecal sludge in industries

Industries in the three cities rely on a variety of fuel sources which could potentially be substituted or supplemented with faecal sludge. Our study showed that in Dakar and Accra, industries use electricity or liquid fuels (e.g., diesel, heating oil, or kerosene) for energy. In Kampala, some companies already use solid fuels, revealing a possible market potential for faecal sludge. And 45 % of the industry representatives interviewed expressed interest in immediately using it as fuel if it met their process requirements [1].

## Faecal sludge as potential fuel

In contrast to sewage sludge, the heating value of faecal sludge has never been thoroughly evaluated. To estimate its energy potential and identify correlations with on-site sanitation technologies, faecal sludge was collected from pit latrines, septic tanks, anaerobic ponds and drying beds. Analysis proved that on average, the faecal sludge calorific value was 17.3 MJ/kg dry solids [2];

thus, it is highly competitive with local biofuels as shown in Figure 1 (FS=Faecal Sludge and WW=Waste Water).

## Up-scaling of faecal sludge as a fuel

In general, fuel supply is a long-term decision for industries and their fuel requirements depend on their specific industrial processes. Given the low solids content of faecal sludge, developing cost-effective drying methods is required for it to be successfully used as a fuel. Research on the physical and chemical properties of faecal sludge is necessary to be able to predict the following characteristics: calorific value, ash content, corrosion potential, emissions and potential odour nuisance. The ideal form of the fuel, and transportation and storage issues, also require analysis.

The next step is to construct demonstration kilns in Dakar and Kampala in collaboration with local industries. In Dakar, different filter materials and natural coagulants will be tested to improve the performance of un-planted drying beds. FaME research results indicate that the potential market for faecal sludge end-products could offer a promising, profitable, and sustainable alternative for faecal sludge management in urban environments worldwide.

[1] Murray, A., Nakato, T., Niwagaba, C., Dione, H., Kang, J., Stupin, L., Regulinski, J., Mbéguéré, M., Strande, L. (submitted): Fuel Potential of Faecal Sludge: Calorific Value Results from Uganda, Ghana and Senegal.

[2] Diener, S., Simiyaga, S., Niwagaba, C., Murray, A., Gning, J. B., Mbéguéré, M., Ennin, J. E., Strande, L. (in preparation): Enhancing the Value Chain: Market Demand for Faecal Sludge in Sub-Saharan Africa.

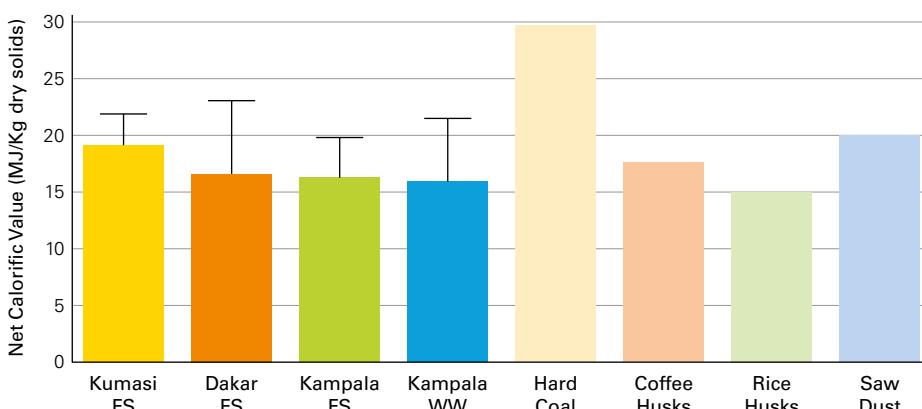


Figure 1: Average net calorific value of raw faecal sludge and wastewater treatment sludge compared to hard coal and biofuels [2].

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The FaME project is funded by a SPLASH grant ([www.splash-era.net](http://www.splash-era.net)). Further information about FaME can be found at [www.sandec.ch/fame](http://www.sandec.ch/fame).

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