

TURNING FAECAL SLUDGE INTO FUEL BRIQUETTES: EXPERIENCES FROM A PARTNERSHIP BETWEEN WATER FOR PEOPLE AND NATIONAL WATER AND SEWERAGE CORPORATION, KAMPALA

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water for people



MINISTRY OF WATER AND ENVIRONMENT



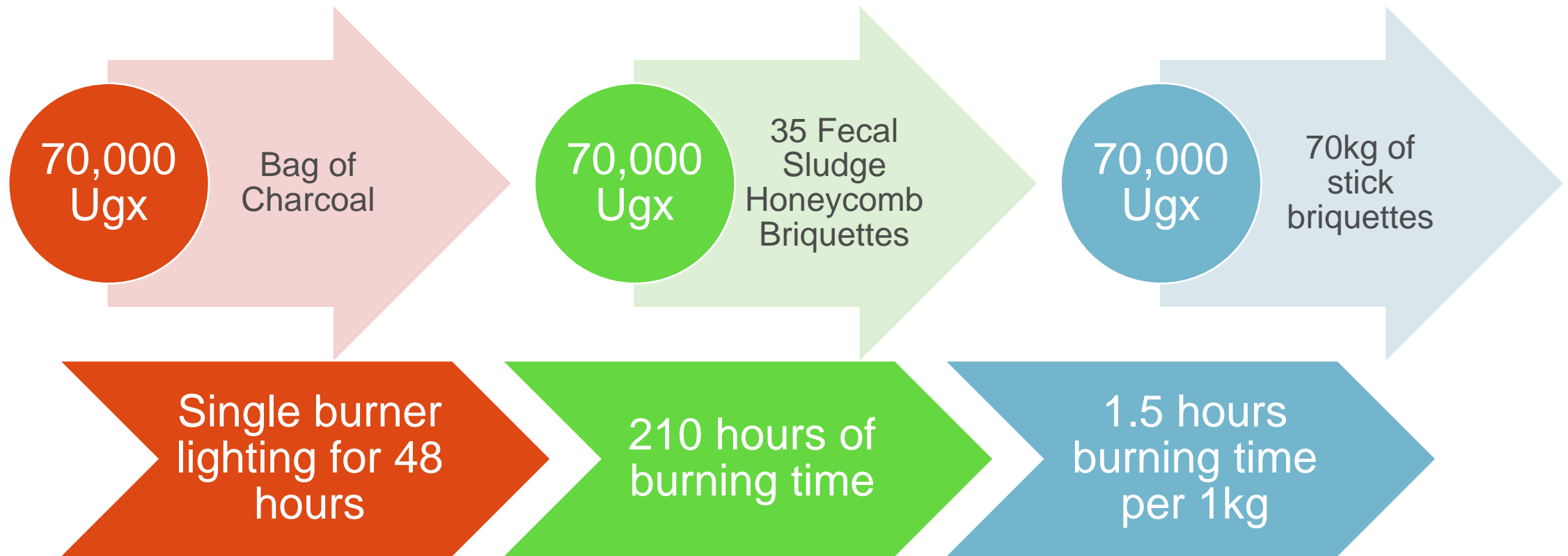
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The Challenge

- For many years in Africa, FS has remained regarded as a hazardous material, given little attention about energy recovery from the bio solids
- The most common reuse option has concentrated on direct application of bio solids onto garden- risk of pathogens especially for vegetables eaten raw
- One product of FS that is most likely to be free of pathogens is the briquettes. The pathogens are killed during the carbonization or pyrolysis process that requires high temperatures
- FS briquettes can be used to replace the wooden charcoal briquettes hence reducing pressure onto the forests in search for charcoal
- FS products are normally challenged by community attitudes due to various beliefs and taboos around faeces handling
- The process of carbonization completely changes the physical appearances of FS to char which is like that from other biomass.

Why Fecal Sludge Briquettes?



The briquettes are 4.4 times more cost effective than the normal charcoal

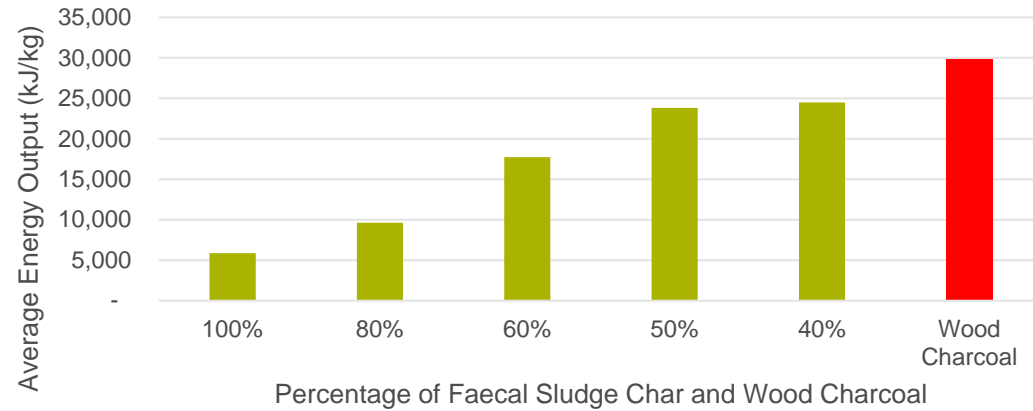
Current Research

- Tested two types of sludge; Bottom Settled and Top Scum
- Tested different combinations with varying amounts of FS and charcoal dust; 100%FS, 80%FS, 60%FS, 50%FS, 40%FS
- Partnered with CAPIDA/SEACO to produce test briquettes
- Carried out tests at CREEC (fuel properties), Central Government Lab (Emissions), Microbiology lab at COVAB-Makerere University (Pathogenic occurrence) and our own mini lab (MC, Ash Content, burning properties and boiling tests)

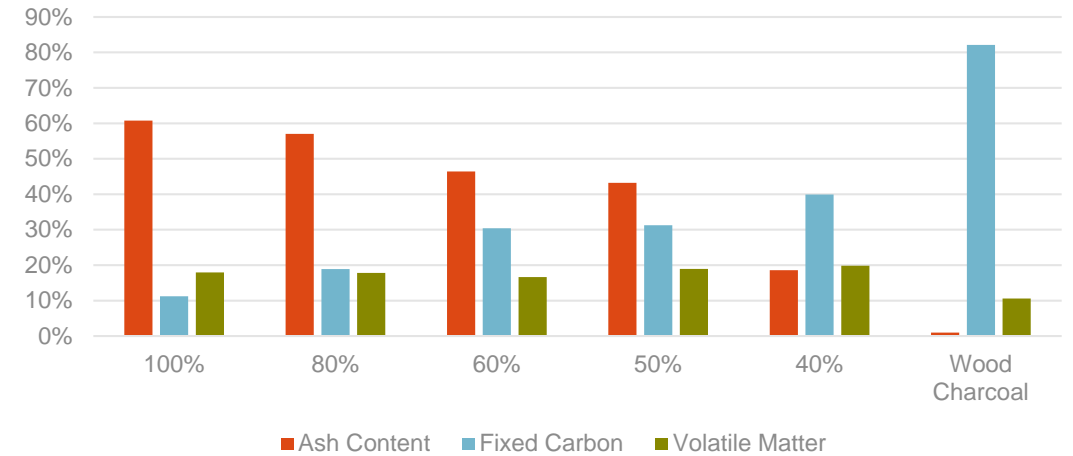
Results so far

- Top scum briquettes overall perform better than bottom sludge briquettes (less sand)
- Organic emissions such as PCBs, Furans and Dioxins were at non-detectable levels
- SO₂, SO₃ levels detected at below 5% and this reduced with reduction in FS
- NO₂ levels at below 1% reducing with decreasing FS content
- P₂O₅ levels at below 10% reducing with decreasing FS Content
- Safety: Briquettes tested negative for Faecal Coliforms, E.Coli and Ascaris (carbonization process at temperatures of above 100 degrees)

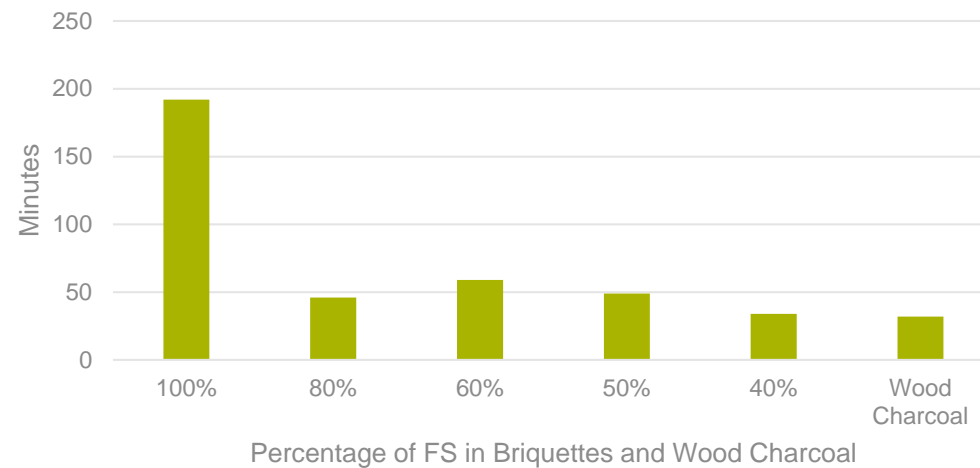
Average Energy Output against Percentage of Faecal Sludge (Top Scum) in Briquettes and Wood Charcoal



Comparison of Wood Charcoal and FS (Top Scum) Briquettes



Time to Boil 5 litres (cold start)



Overview of Current Operation

- Sludge drying & storage
- Carbonization
- Briquette production

Current Operations at Lubigi Wastewater Treatment Plant



Water For People currently operating sludge drying/storage and carbonization facilities at National Water & Sewerage Corporation (NWSC) Lubigi Wastewater Plant. Future plans envision expanded operation with consolidated briquette production facility at the plant.

Sludge Storage & Drying at Lubigi Greenhouse



Water For People converted one of NWSC sludge drying beds into covered/enclosed facility (known as the greenhouse) for effective drying and storage of sludge used for carbonization and briquette production



Construction of Carbonization Unit at Lubigi Site



Commissioning of Carbonization Unit



Commissioning of the newly constructed carbonization unit is ongoing, with testing to determine procedures and loading rates for optimum operation.



Nyanama Briquette Production Site



Water For People has been piloting the production of fecal sludge briquettes at a small demonstration facility in Kampala. The facility includes a receiving/storage area for sludge and charcoal dust, a single-drum carbonization unit, briquette extruding machines, and a storage/drying area for finished briquettes.

Extruders at Nyanama



The pilot facility includes locally fabricated briquette extruding machines for both stick and honey briquettes



Briquette Drying at Nyanama



Manufactured briquettes are stored and dried prior to packaging and sales. Stick and honeycomb briquettes have been on an informal basis to a variety of customers to test potential markets.

Packaging at Nyanama for Informal Sales



Stick briquettes, packaged in 5 kg sacks have become popular for domestic cooking use. Following a recently completed market assessment, Water For People intends to focus its sales of this product on supermarkets and chicken farmers



Lessons Learnt

- Production: Infrastructure, Raw materials, Machinery, Labour, Carbonization, Drying
- Safety and Health
- Product Quality and features
- Product Perceptions

Recommendations

- Based on WRP market assessment, focus on two market segments:
 - Chicken farmers
 - Supermarkets catering to middle class consumers
- New legal entity required before expanding beyond current informal sales
- Consolidate production at one facility – Lubigi
- Need to establish reliable quality & delivery performance
- Briquette Design Optimization (Replace charcoal input)
- Increase Production to 5 tonnes/week
- Training RRR businesses on incorporation of FS in Briquette Production (GIZ)



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