An In-Demand Reuse Option for Human Waste: Feces Briquettes

Emily Woods, Andrew Foote, Hana Lokey
Past and Current Work

- Successful pilot of 300 refugees in 2 month pilot test.
- Discussing opportunities to scale model with NRC and UNHCR

- Currently 50 HH, 100% retention rate on toilet subscription
- Expect 100,000 toilet users in 3 years
- Produced over 2,000 kg of charcoal briquettes
Customer Oriented Waste Collection

Waste Treatment & Transformation

Affordable Fuel
Customer oriented waste collection
Waste treatment and transformation
Affordable fuel
Pathogen | At T=6 hours
---|---
Helminth | > 3 log inactivation
E. Coli | > 6 log inactivation
Clostridium Perfrigens | > 3 log inactivation

Customer oriented waste collection  Waste treatment and transformation  Affordable fuel
Poop + Flowers = Affordable Fuel

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Net Calorific Value (MJ/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Wood (air dried)</td>
<td>14.7</td>
</tr>
<tr>
<td>Local charcoal</td>
<td>26.2</td>
</tr>
<tr>
<td>Sanivation Briquettes</td>
<td>18.7</td>
</tr>
</tbody>
</table>

Customer oriented waste collection
Waste treatment and transformation
Affordable fuel
MaKaaduma

- Average CO emissions of 60 ppm
- Save 88 trees for every ton of new charcoal
- Sold at $170/ton ($70 profit). Local Charcoal is up to $600/ton.
What people say

“I cooked dinner and breakfast on the *SAME* briquettes”

“I can finally cook inside”

“Smoke doesn’t hurt my eyes”

“Doesn't taste like anything”

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Charcoal</th>
<th>MakaaDumu</th>
<th>Briquette w/out feces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of ignition</td>
<td>Fair</td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Time to boiling after ignition</td>
<td>Fair</td>
<td>Fair</td>
<td>Poor</td>
</tr>
<tr>
<td>Sustained boil</td>
<td>Fair</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Smoke emitted</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
</tr>
</tbody>
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Questions?

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Kenyan Fuel Market

Charcoal Prices in East Africa

Five-fold increase in charcoal prices in the past decade

Kenya Charcoal Market

<table>
<thead>
<tr>
<th>Charcoal sold per year</th>
<th>$427 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market share captured</td>
<td>0.5%</td>
</tr>
<tr>
<td>Annual market</td>
<td>$2.1 million</td>
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</tbody>
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