Report on Gasifier Cookstove Inception Workshop in Nakuru.

African Centre for Technology Studies

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Acknowledgement

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1. Summary

African Centre for Technology Studies in collaboration with The Energy Resource Institute of India is working on enhancing clean energy access among rural and peri-urban households in Kenya. The programme targets mainly the poor and middle income earners. The centre co-hosted gasifier cookstove workshop in collaboration with SNV-Kenya and Sustainable Community Development (SCODE) on 23rd January 2014. The workshop brought together over forty participants including entrepreneurs of improved cookstoves, representatives from microfinance institutions, improved cookstove fabricators, research and development institutions. This was meant to introduce gasifier technology among participants and brainstorm on the way forward towards dissemination of over 2500 cookstoves in 2014.

2. Workshop Background

Research findings indicate that on average, the largest portion of household budget, approximately 85% for the rural poor and 65% of the urban poor is directed to food consumption. This means that the poor have little to spend on other essential services such as energy. Lack of access to modern and clean forms of energy affects sustainable development in various ways. Indoor air pollution from biomass use has been occasionally linked with serious and widespread health problems, especially for women and children. This reduces labour productivity and exacerbates poverty. Besides, household income now has to be spent on treatment costs, leaving less disposable income to meet other needs. The poor face another problem of high cost of fuelwood and charcoal. The long hours women need to search for wood reduces time available for other productive activities. Mainly women and school going children spent much of their time in search of fuel wood. The increasing shortage of wood fuel and the high cost of charcoal may lead the poor to using dried dung, resulting in a decrease of organic fertilizers available for agriculture and worsening indoor air pollution. In urban areas, majority of households depend on wood fuel, with 60% using charcoal.

3. Introductory remarks

The workshop commenced with introductory remarks from representatives of SNV-Kenya programme (Mrs. Caroline Toroitich, SCODE (Mr. John Maina) and African Centre for Technology Studies (Mr. Wycliffe Amakobe). The remarks offered participants an opportunity to learn of current programmes being undertaken by the respective organizations. However, attention was accorded to activities relating to dissemination of clean cookstoves in Kenya.
3.1 SNV

RE Sector- facilitating access to RE for cooking and lighting
Cooking devices used by the majority of households have very poor thermal efficiency and serious health influences due to unclean combustion. This combination together with unsuitable cooking spaces is the main cause of Indoor Air Pollution (IAP) in Kenya estimated to be causing the death of 14,300 people annually. As such, SNV seeks to pilot efficient biomass combustion technologies, the case of gasifiers.

Fuel Efficient Cook stoves Adoption in Kenya- An Inclusive Business Case (SNV-Kenya)
The objectives of this programme are:

- To improve the livelihoods of estimated 15,000 people in poor urban and peri-urban areas of Kenya through access to and use of affordable clean and efficient cooking stoves and fuels within the two year project period.
- The stoves to be disseminated are gasifiers and with time introduce pellets as alternative fuel
- The target market is urban and peri-urban households without access to free biomass, and already have purchasing power for cooking fuel.

The fuel will be switched from charcoal and kerosene to pelletized waste biomass such as husks, straw from agriculture, sawdust and other wood waste. The pellets, when used in the gasifying stove, are a cheaper fuel than charcoal, kerosene. In addition to the savings on fuel, the stove provides high-powered, virtually smokeless and variable temperature cooking. To tackle affordability, in the proposed model the stove will be sold on credit to be repaid through purchase of pellets which will be priced to include the cost of stoves.
The intervention areas of the project

- Promotion and marketing of gasifier stoves.
- Development of fuel pellets and gasifier stove supply chain.
- Develop and strengthen partnerships for dissemination.
- Together with partners, develop innovative financing mechanisms.

Activities to be supported under the project

1. Pellet feasibility study.
2. Business opportunity seminars for entrepreneurs.
3. Promotion and marketing.
4. Training in pellet production.
5. Business development training for pellet and stove dealers.

3.2 SCODE
Sustainable Community Development Services (SCODE) is a reputable and well networked community development organization promoting clean energy products and services in Kenya. Since its inception in 1996, SCODE has been involved in the renewable energy sector specifically in development and dissemination of improved cook stoves, solar and biogas technologies in Kenya. ACTS is collaborating with TERI(INDIA) to import fabrication technology from India to Kenya through technology orientation and training to SCODE, a local cookstove fabricating company. The tri-patriate engagement between the two research centres and SCODE is envisioned to have local technicians attain the necessary skills to fabricate quality and standard gasifier cookstoves with recommended efficiencies in attempt to save on householder expenditure on fuel as well as salvage the deteriorating woodlots due to fuel search.

3.3 ACTS
African Centre for Technology Studies is implementing a three-year programme that seeks to increase access to clean lighting and cooking devices in Kenya. This project is a collaborative action-research being undertaken by ACTS through the DFID-TERI Partnership and aims at piloting scalable models for provision of clean lighting and improved cookstove solutions for poor households in Kenya. Through the programme, DFID is supporting research and piloting of innovative or improved technologies and private sector-led business models which will increase community awareness and demand, enable provision of appropriate products and services, and thereby promote the use of solar lighting solutions and energy efficient stoves on a much larger scale. This is being done through review of existing technological solutions and business/delivery models and identification of barriers to the promotion of clean energy options.

The approach here focuses on biomass burning gadgets incorporating solar lighting and powering devices as shall be highlighted in the demonstration section. The gasifier cookstove comes together with a solar panel and a solar lamp for lighting and a mobile phone charging system. The centre is entering into partnerships with related research, business and technology organizations in creating a sustainable channel to disseminate over 2500 cookstoves.
4. Gasifier Technology

A gasifier stove is a biomass fuelled cookstove designed in such a way that the fuel undergoes three process with final release of hot gaseous flames without emission of smoke. The fuel is converted into combustible gases through intense heating which then burn with a clean flame. This is made feasible by use of primary and secondary aeration within the combustion chamber. The chamber is constructed to sustain temperatures in the range of 800-1600 degrees Celsius. The technology promoted under this programme ensures utility of various biomass resources with moisture benchmark of 20% on wet basis otherwise the combustion will be compromised. The stoves are very compatible to the cooking habits of the rural majority who currently rely on firewood as fuel. The purpose of secondary aeration is to generate a forced draft mechanism for complete fuel combustion.

4.1 Demonstration session

Mr. Wycliffe Amakobe (African Centre for Technology Studies) demonstrated how to light TERI-ACTS Gasifier cookstove and Philips gasifier cookstoves with keen emphasis on the precaution measures.

4.1.1 Philips gasifier cookstove

The stove comes with internally fitted battery and fun that supports oxidation of fuel. The battery is charged using electrical power source with possibility of using an adopter for DC sources.

4.1.2 TERI-ACTS gasifier cookstove

This comes along with a charge controller integrated with one light and a mobile charging system. The system comes along with a solar panel that powers the battery fixed within the charge controller.
Both stoves demonstrated best burning characteristics when used with pellets. However, there combustion rates when burnt with charcoal and dry wood have efficiencies far beyond the local ceramic jikos that are commonly used among peri-urban households. Note that the two stoves are constructed in such a way that they support combustion of various forms of biomass. Users need to note the fact that the fire output depends on calorific value of fuel used.

5. **Integrated Business Model Concept**

5.1 **Renewable Energy Technology (RET) Scenario**
There are multiple producers of RET targeting the same market, each Supplier tries to reach the market, each incurs training, promotion and delivery costs and each employs staff to manage key accounts.

5.2 **General observations on factors hampering ICS**
- Lack of wide demonstration effect and thus awareness not just on the existence but on the benefits of ICS;
- High upfront cost constraining end-user demand,
- Limited access to affordable finance for ICS dealers and manufacturers to expand and improve efficiency of operations as they cannot afford to buy e.g. in high volumes, increase their storage capacity, and build up effective distribution chains.
- MFIs hesitate lending to manufacturers, dealers and end-users, because they are not able to bridge the perceived viability gap by themselves.
- Little to no experience in doing due diligence for ICS, no data on lending risks and default rates, uncertainty about credit demand, not to mention the costs of setting up new credit lines has so far restrained MFIs to take up this business case

5.3 **Specific challenges among RET Suppliers**
- Lack resources for Consumer Education.
- Delivery costs prohibitive say; truckload needed.
- Prices beyond normal household ability
- Low local capacity for stocking/installation
- Inferior & Low Quality products flood the market
- Low Regulatory & policy support
5.4 Specific challenges among RET Consumers

- Consumers grapple with multiple suppliers.
- They are bombarded with fragmented information, so they ‘‘buy’’ what is available without options.
- Knowledge dissemination on the different types of RET’s very poor.
- Consumers get poor un-guaranteed products.
- Consumers have no recourse for failed products.
- After Sales Service scanty.
- Basic Repairs and Maintenance expensive.
- Consumers travel to main towns for services.
- Consumers exploited on prices.
- Low economic activities leading to low incomes.
- Sparsely populated.
- Unfriendly transport infrastructure.
- Illiteracy leading to poor decision making.
- Un-coordinated demand structures.
- Biomass resources becoming scarce.
- Buying decision heavily relying on men.
- Dependence where NGOs are involved.
5.5 Specific challenges among RET Financiers

- High Costs of Research & Product Development.
- Financial Institutions grapple with multiple suppliers and multiple products.
  - Staff have to try and “Master” all for selling.
  - Delivery hitches a nightmare.
  - Consumer Education not focused on.
- Supplier Capacity Challenges.
  - Stock outs.
  - Staff Capacity for Training.
  - Quality Assurance.
  - After Sales Challenges.
- Perceived high transaction costs for RET loans.
- Low creativity and risk adverse business trends.
- Little or no concerted effort towards marketing.
- Bias towards bigger business loans to meet disbursement targets thus ignoring smaller social loans.
- There are many competing products for Staff time.
- New products are being seen as additional work especially those requiring “technical” details.
- Reputation Risk due to product failure.
- Poor or Low partnership management skills.
- Low marketing and capacity building support.

6. Consolidator Model

Figure 1: Chart showing the process of distribution of different RET products from the manufactures - consolidator - financial institutions - product agents to the consumers.
6.1 Overall benefits of the integrated model

1. Increased Market Penetration for RET.
2. No additional/minimal workforce required.
3. Minimal cost for Staff Training and Roll out.
4. Staff concentrates on Core business of the firm.
5. No ‘multiple information’ overload for staff.
6. Additional Incomes through fees and interest.
7. Use loyal customers to market products.
8. Increased customer loyalty.
9. Consumers have wide range to choose from.
10. Vetting of Suppliers Capacity and Ability to deliver their promise.
11. The logistics headaches of Sourcing, Delivery and After Sales Services sorted.
12. Increased Capacity Building at Customers and Institutional levels.
13. New Income streams at grass-root level.
15. Improved Consumer Awareness/Education.
16. Potential for related products e.g. WASH
Table 1: Table showing the Energy sources & Expenditure (Monthly) in Lighting and cooking.
### Table 1: Renewable Energy Technology Scenario

<table>
<thead>
<tr>
<th>Product Price</th>
<th>Improved Cooking Stoves - ICS</th>
<th>Solar</th>
<th>ICS+Light</th>
<th>Loan Repayment Period</th>
<th>Multi P</th>
<th>Kisasa 1</th>
<th>Kisasa 2</th>
<th>One Degree</th>
<th>Gasifier=16,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,040</td>
<td>6,000</td>
<td>9,050</td>
<td>9,240</td>
<td>16,100</td>
<td>816</td>
<td>2,400</td>
<td>3,620</td>
<td>3,696</td>
<td>6,440</td>
</tr>
<tr>
<td>6 Months</td>
<td>408</td>
<td>1,200</td>
<td>1,810</td>
<td>1,848</td>
<td>272</td>
<td>800</td>
<td>1,207</td>
<td>1,232</td>
<td>2,147</td>
</tr>
<tr>
<td>9 Months</td>
<td>204</td>
<td>600</td>
<td>905</td>
<td>924</td>
<td>163</td>
<td>480</td>
<td>724</td>
<td>739</td>
<td>1,288</td>
</tr>
<tr>
<td>12 Months</td>
<td>136</td>
<td>400</td>
<td>603</td>
<td>616</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly Energy Expenditure</td>
<td>3,000</td>
<td>50% Saving</td>
<td>1,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 2: Financial Institution Business Case

<table>
<thead>
<tr>
<th>COUNTY</th>
<th>Population</th>
<th>H/Holds</th>
<th>1% Target</th>
<th>KCJ = 2,000</th>
<th>Gasifier=16,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYANDARUA</td>
<td>596,268</td>
<td>143,879</td>
<td>1,439</td>
<td>2,877,580</td>
<td>23,020,640</td>
</tr>
<tr>
<td>NYERI</td>
<td>693,558</td>
<td>201,703</td>
<td>2,017</td>
<td>4,034,060</td>
<td>32,272,480</td>
</tr>
<tr>
<td>MURANGA</td>
<td>942,581</td>
<td>255,696</td>
<td>2,557</td>
<td>5,113,920</td>
<td>40,911,360</td>
</tr>
<tr>
<td>KIAMBU</td>
<td>1,623,282</td>
<td>469,244</td>
<td>4,692</td>
<td>9,384,880</td>
<td>75,079,040</td>
</tr>
<tr>
<td>KITUI</td>
<td>1,012,709</td>
<td>205,491</td>
<td>2,055</td>
<td>4,109,820</td>
<td>32,878,560</td>
</tr>
<tr>
<td>KISUMU</td>
<td>968,909</td>
<td>226,719</td>
<td>2,267</td>
<td>4,534,380</td>
<td>36,275,040</td>
</tr>
<tr>
<td>NAKURU</td>
<td>1,603,325</td>
<td>409,836</td>
<td>4,098</td>
<td>8,196,720</td>
<td>65,573,760</td>
</tr>
<tr>
<td>LAIPIA</td>
<td>399,227</td>
<td>103,114</td>
<td>1,031</td>
<td>2,062,280</td>
<td>16,498,240</td>
</tr>
<tr>
<td>TOTAL</td>
<td>7,839,859</td>
<td>2,015,682</td>
<td>20,157</td>
<td>40,313,640</td>
<td>322,509,120</td>
</tr>
</tbody>
</table>
7. Plenary Discussions

There were three groups presenting:

a) Financiers.
b) SMEs.
c) Others.

7.1 Financiers

Positive experiences

1) There is customer loyalty.
2) There is increased clientele.
3) Cross selling.
4) Low risk.
5) High portfolio.

Negative experiences

1) Faulty /low quality risk
2) Brand reputation risks F1.
3) Capacity by supplier is inadequate.
4) Over loaded fatigued officers.
5) Low buy in.
6) Delivery.

Challenges

1) Lack of capacity building. There is no sufficient training system to better the skills of the personnel.
2) Inadequate information. Knowledge dissemination is at a bare minimum. Proposing appropriate delivery model.

### Table 3: Business projections from the Sales/Loan projections

<table>
<thead>
<tr>
<th></th>
<th>PILOT</th>
<th>ROLL OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Branches</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>Number of PAs per Branch</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Total PAs</td>
<td>48</td>
<td>100</td>
</tr>
<tr>
<td>Average Sales per Month per PA</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Average Loan Size (Stove + Solar)</td>
<td>7.890</td>
<td>7.890</td>
</tr>
<tr>
<td>Total Number of Loans per Month</td>
<td>144</td>
<td>300</td>
</tr>
<tr>
<td>Total Disbursements per month</td>
<td>1,136,160</td>
<td>2,367,000</td>
</tr>
<tr>
<td>Annual Number of Loans</td>
<td>864</td>
<td>3,600</td>
</tr>
<tr>
<td>Annual Disbursements</td>
<td>6,816,960</td>
<td>28,404,000</td>
</tr>
<tr>
<td>Interest Earned</td>
<td>1,227,053</td>
<td>5,112,720</td>
</tr>
<tr>
<td>Loan Related Fees</td>
<td>68,170</td>
<td>284,040</td>
</tr>
<tr>
<td>TOTAL BRANCHES</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>TOTAL GROUPS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL STAFF</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>TOTAL CLIENTS</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>Commission for PA</td>
<td>514</td>
<td>514</td>
</tr>
<tr>
<td>Average PA Earnings per Month</td>
<td>1,543</td>
<td>1,543</td>
</tr>
</tbody>
</table>
Delivery model

Appropriate delivery channel

- Stream-line the production process.
- Have whole seller as intermediary.
- Have adequate capacity building.
- Price control measures.

7.2 Entrepreneurs

Challenges

a) High prices of the technology.
b) High fuel prices.
c) Lack of knowledge dissemination on the use on the RETs.
d) Low availability of the pellets. Pellets are laborious to make.
e) General maintenance of the stove, especially the electrical parts and lining.
f) Acceptability to the local communities.
g) Size of the pots used on the jikos. It would be cumbersome to use a large pot on a small jiko.
h) Defaulting. Most entrepreneurs will require credit to purchase the stoves. In case they do not move this will require defaulting of loans.

7.3 Others

Challenges

1) Less stock.
2) Late delivery
3) High pricing.
4) Handouts (Most people expect free things from NGOs)
5) Intermediary. Middle men can be very expensive.
6) Lack of awareness. Knowledge dissemination is at a very slow rate.
7) Cultural habits. Some communities may not be willing to use the new forms of renewable energy like farm waste.

7.4 Way forward

a) Credit facilities.
b) Capacity building.
c) Train to service & maintenance.
d) Awareness creation.
e) Promotion.
8 Conclusion

Improved cookstoves sector in Kenya has faced various challenges in terms of technology introduction and uptake. This has its roots from regulators, service providers, technology implementers, and beneficiaries. As such, approaches in this sector need critical planning before any intervention. This workshop recognized the need to involve necessary stakeholders as a planning stage in the planned dissemination. Household gasifies are not common on Kenyan market hence strategies towards its introduction and adoption are crucial. Following the successful completion of the workshop, interested entrepreneurs and micro-finance institutions were incepted and will be engaged to create an appropriate dissemination channel. Respective partners will consider the comments cited before coming up with desirable model that will be used in the channel. Capacity building and awareness were regarded pragmatic for success of cookstove uptake among communities, taking into account that gasifiers have distinct technological incorporation and subsequent financial implications.