Pre - Evaluation on TIDE Sarala Stoves
& Possible Firewood Cook Stove Alternatives
Why was Earth Stoves chosen to be a viable option in the first place?
An exhaustive survey was conducted in early 2014 on the preferences on cook stoves by different urban migrant communities in Bangalore. A **majority of people chose earth stoves – Astra type** (along with LPG cook stoves) over Biofuel Briquettes and Chimney Extractor types.
One of the major positives of the Astra type stoves other than the low price was that the people were already familiar with it and therefore did not have to change their cooking habits, often the taste of the food is associated to the style of cooking. But it required continuous maintenance and usage to avoid deterioration. Also, the stoves are not portable, a major hindrance to urban migrant communities which are forced to move around often.

Earth Stove (Astra type)

(44/100)

Why YES
- Multiple cooking with same quantity of wood
- No smoke
- Safe even when children are around as it is covered
- Uses existing method of cooking- hence familiar with technique

Why NO
- Not portable
- Have to make a hole for pipe
Sarala Cooking Stove

These are two pan low cost stoves for domestic cooking in households. These stoves are smokeless, compact, durable, low-cost and compatible with a wide range of solid biomass.

Application
House hold cooking for a family size of 4 to 5

Dissemination Strategy
Through women entrepreneurs

No. of Installations
more than 20000

Specifications
Door size = 15 cm x 15 cm
Grate size = 4 inch by 4 inch
Chimney dimensions = 10 ft by 3inch dia
Pan diameter = 23 cm and 20 cm.

Features claimed by TIDE

- Can burn a variety of biomass fuels
- Chapathi /Rotti in first pan. Rice Sambar, dal , water ,milk boiling in second pan.
- Smoke-free working environment
- Use of moulds for onsite stove construction with consistent dimensions that provide consistent performance
- Compact, with low space requirement (Therefore, suitable even for small kitchens)
- Easy to install and operate, no deviation in cooking practice
- Conserves at least 25%-30% of biofuels as compared to open cooking
- Saves 500kg of firewood in a year.
Selco Foundation trials of TIDE Astra Stoves in Bangalore
TIDE Astra Stoves have been installed as part of the H.U.M (Housing for Urban Migrants) project in 2 places inside 3 units.
What is the **current condition** of these stoves? What are the **issues** faced by users?
**Condition:** Good working condition. Chimney extracting all of the smoke.

**Time taken to boil 2L of Water with 400gm of Wood on Main Pan:**
10 mins 15 secs

**Reason:** Not maintained and cleaned properly.

**Decrease in Efficiency in 13 months**

**Condition:** Still Working but in bad condition. Chimney only a part of the smoke. Lady makes a hole on the tarpaulin to vent out the remaining smoke. Not ‘smokeless’ any more.

**Reason:** Not maintained and cleaned properly.

**Time taken to boil 2L of Water with 500gm of Wood on a Traditional Chulha is 14mins**

**Condition:** Dilapidated condition. Used as a traditional chulha. Chimney removed. Smoke fills the house. Purpose of stove not served.

**Reason:** Not maintained and cleaned properly.

**Time taken to boil 2L of Water with 400gm of Wood on Main Pan:**
14 mins 30 secs

Lack of maintenance and cleaning led to the deterioration of the stove over time. This further resulted in cooking becoming a tedious affair because of the lack of efficiency and escape of smoke into the room. This may be a result of lack of ownership of the stove.
Current Condition of the Stove

The Chimney has been removed. Smoke fills the room while cooking. The user complained that cooking is tedious and takes longer to cook.
January 2015

**Condition:** Good working condition. Chimney extracting all of the smoke.

February 2015

**Condition:** The Stove was working properly with no smoke inside the unit. There was smoke when bigger vessels were used.

Reason: Larger Cooking Vessel does not fit into the stove perfectly.

One week later

**Condition:** The Stove is cracking and breaking up.

**Reason:** Lack of usage, since the mud needs to be baked continuously to maintain the strength and form.

---

**Overall Condition** of the stove is **satisfactory.** Importance of constant usage to avoid cracking became apparent.
Low Moisture Content Wood and dried Twigs have to be used to avoid smoke within the house. But the urban communities in Bangalore may not have access to the right kind of wood always and therefore the stove will not be effective always.

The Urban Migrant Communities stock up firewood from their place of work or nearby areas. They sometimes have to settle for undried twigs for combustion.

The stove fails to extract the smoke when undried wood is used. The smoke burns the eyes and fills the house with unbreathable air, cooking becomes a tedious task.

When dried wood is used, the problem of smoke does not arise.
Why **TIDE Sarala Stoves** make sense in terms of Costs and Affordability...
### 1 Unit

<table>
<thead>
<tr>
<th>TIDE Stove</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>350</td>
<td>1</td>
<td>350</td>
</tr>
<tr>
<td>Entrepreneur</td>
<td>900</td>
<td>1</td>
<td>900</td>
</tr>
<tr>
<td>Transportation</td>
<td>250</td>
<td>1</td>
<td>250</td>
</tr>
<tr>
<td>Mud &amp; Bricks</td>
<td>425</td>
<td>1</td>
<td>425</td>
</tr>
<tr>
<td>Concrete Chimney</td>
<td>460</td>
<td>1</td>
<td>460</td>
</tr>
<tr>
<td>Frame &amp; Grate</td>
<td>360</td>
<td>1</td>
<td>360</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>2745</strong></td>
</tr>
<tr>
<td><strong>Per Unit Cost</strong></td>
<td></td>
<td></td>
<td><strong>2745</strong></td>
</tr>
</tbody>
</table>

### 5 Units

<table>
<thead>
<tr>
<th>TIDE Stove</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>350</td>
<td>1</td>
<td>350</td>
</tr>
<tr>
<td>Entrepreneur</td>
<td>900</td>
<td>1</td>
<td>900</td>
</tr>
<tr>
<td>Transportation</td>
<td>250</td>
<td>1</td>
<td>250</td>
</tr>
<tr>
<td>Mud &amp; Bricks</td>
<td>425</td>
<td>5</td>
<td>2125</td>
</tr>
<tr>
<td>Concrete Chimney</td>
<td>460</td>
<td>5</td>
<td>2300</td>
</tr>
<tr>
<td>Frame &amp; Grate</td>
<td>360</td>
<td>5</td>
<td>1800</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>7725</strong></td>
</tr>
<tr>
<td><strong>Per Unit Cost</strong></td>
<td></td>
<td></td>
<td><strong>1545</strong></td>
</tr>
</tbody>
</table>

### 10 Units

<table>
<thead>
<tr>
<th>TIDE Stove</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>350</td>
<td>1</td>
<td>350</td>
</tr>
<tr>
<td>Entrepreneur</td>
<td>900</td>
<td>1</td>
<td>900</td>
</tr>
<tr>
<td>Transportation</td>
<td>500</td>
<td>1</td>
<td>500</td>
</tr>
<tr>
<td>Mud &amp; Bricks</td>
<td>425</td>
<td>10</td>
<td>4250</td>
</tr>
<tr>
<td>Concrete Chimney</td>
<td>460</td>
<td>10</td>
<td>4600</td>
</tr>
<tr>
<td>Frame &amp; Grate</td>
<td>360</td>
<td>10</td>
<td>3600</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>14200</strong></td>
</tr>
<tr>
<td><strong>Per Unit Cost</strong></td>
<td></td>
<td></td>
<td><strong>1420</strong></td>
</tr>
</tbody>
</table>

The Cost can be reduced by a factor of about **50%** by going for 10 units instead of 1 unit. The all inclusive price of **sub 1500 levels** makes it a worthy add-on to the H.U.M house. Currently no other smokeless firewood stove comes at this price point.
Inference

TIDE Sarala Stove is the cheapest smokeless firewood stove available. It conforms to the traditional cooking practices and therefore attracts a natural liking by migrants. It can be used to cook multiple dishes at the same time. It has been installed in over 20000 locations and has proved its efficiency in the market.

But...

TIDE Sarala Stove requires frequent maintenance and persistent cleaning. Failing which the stove will deteriorate over time. This will result in a drastic decrease in efficiency, leading to cooking becoming a tedious task. Therefore, Ownership is key for a sustained impact on users.

Why alternatives has to be explored...

The Urban Migrant Communities which are particularly prone to constant moving requires a portable option which does not have bulky chimneys. The people also often go to their villages for multiple months leaving the stoves behind. The Sarala stove disintegrate faster with non usage. Also, the people do not have a steady supply of dried firewood always and therefore requires to be catered to with a smokeless cooking stove that can burn all kinds of firewood for maximum impact.
Possible Alternatives...
PYRO MINI

- **PYRO Mini** is a versatile, portable 2 pan domestic wood burning stove for cooking a variety of food items like roti, rice, curry etc.

- The stove is designed for ‘on site assembly’ for easy transportation. It has a mild steel body and is insulated (to prevent heat losses) using castable refractory.

- Simultaneous cooking in two pans saves cooking time, increases efficiency and reduces fuel consumption. The 2 pan design also offers flexibility in cooking by interchanging vessels depending on the amount of heat required.

**Features & Usage:**

- Consists of components which can be assembled onsite
- 2 variants: with chimney (Model A) & without chimney (Model B)
- Burning Rate: 0.7 – 1.0 kg/hour
- Natural draft: Does not use fans or batteries
- Grate: for complete combustion of fuel
- Height: 25 cm, total weight: 14 kg
- CO Emissions: significantly lower than conventional stoves.
- Reduces for use with vessels smaller than 25 cm dia available on request.

**Designed for**

- For cooking all types of food for the household (family size 5-6 members) for cooking all typical Indian food.

**Fuel type**

- Firewood, all agro residues e.g. corn cobs, coconut waste, chilli and sunflower stalk, briquettes etc. (not recommended for loose fuel saw dust etc.)

**Heat utilization efficiency**

- 31% (reduces fuel consumption by half)

**Health benefits**

- Improves respiratory health, no eye irritation.

**Time saving**

- In collection of fuel

**Environmental benefits**

- Reduced CO and particulates (PM$_a$) and conservation of biomass

**Cost of Stove**

- Rs 2700/-: Model A, Rs 2400/-: Model B (Does not include cost of reducers, transportation at actuals, taxes as applicable). Chimney has to be procured locally for Model A.
The Global Alliance for Clean Cookstoves gives the following alternatives for Smokeless Firewood Cookstoves for less than 150 USD...
Shakti Chula V.2

Future Carbon Ltd.

Rugged and robust body made of Galvanized Plate/Iron. Combustion chamber is made of Stainless Steel. Intelligent smoke outlet (perforated burner) system engineered to prolong smoke exertion from the burning chamber and forged to maximize the existence of heat into the stove. Crack prevention improvised body significantly improved the durability and lifetime usage to ensure long-term sustainable performance. Portable for cooking practice anywhere. Affordable for low income group.

Information for consumers

<table>
<thead>
<tr>
<th>Pot capacity (min/max)</th>
<th>2.0 / 50.0 L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate lifetime</td>
<td>5 years</td>
</tr>
<tr>
<td>People fed (min/max)</td>
<td>2 / 12</td>
</tr>
<tr>
<td>Pot type accommodated (Flat bottom/Round bottom)</td>
<td>Both</td>
</tr>
<tr>
<td>Common foods cooked</td>
<td>Rice, meat, vegetable &amp; all kinds of regular meal</td>
</tr>
<tr>
<td>Does it come with a manufacturer’s warranty?</td>
<td>Yes</td>
</tr>
<tr>
<td>Warranty details</td>
<td>2 years parts and service warranty.</td>
</tr>
</tbody>
</table>

General information

<table>
<thead>
<tr>
<th>Manufactured in</th>
<th>Bangladesh</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSRP (min/max) ₲</td>
<td>USD 25.80 / USD 28.00</td>
</tr>
<tr>
<td>Dimensions (l/w/h)</td>
<td>266 / 266 / 304 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>5.5 kg</td>
</tr>
<tr>
<td>Shipping dimensions (l/w/h)</td>
<td>330 / 355 / 368 mm</td>
</tr>
<tr>
<td>Shipping weight</td>
<td>7.0 kg</td>
</tr>
<tr>
<td>Can it be assembled locally?</td>
<td>Yes</td>
</tr>
<tr>
<td>Materials for local assembly</td>
<td>Galvanized Plate/Iron, Stainless Steel, Steel, Glass wool.</td>
</tr>
<tr>
<td>Other information</td>
<td>Better heat obsession to keep body hot due to improved thermal insulation. Crack and fragile proof body. Designed to meet the low income group requirement.</td>
</tr>
</tbody>
</table>
Sampada

Appropriate Rural Technology Institute (ARTI).

Developed in 2006 by ARTI (Appropriate Rural Technology Institute), distributed by Samuchit Enviro-Tech Private Limited in India. The stove is designed to burn wood or other biomass and to produce charcoal. The outer body of the stove is stainless steel, and the inner parts are steel.

### Information for consumers

- **Pot capacity (min/max)**
- **Approximate lifetime**
- **People fed (min/max)**
- **Pot type accommodated (Flat bottom/Round bottom)**: Both
- **Common foods cooked**

This stove is deployed in India.

### General information

- **Manufactured in**: India
- **MSRP (min/max)**: USD 38.00 / USD 43.00
- **Dimensions (l/w/h)**: 240 / 240 / 365 mm

- **Can it be assembled locally?**: No
Rua

Manufactured in Vietnam

Fan fed TLUD designed for rice husk. They are very popular and are sold in large numbers without subsidy. Works great as an automatic rice cooker with 3 cups husk for 1 cup rice. A fan delivers a small amount of air to the bottom of a biomass cylinder and a large amount of oxygen at the top of the cylinder. This heating of the biomass in a low oxygen environment results in the production of charcoal (biochar) and a large amount of smoke. This smoke is then burnt in the plate of fire which occurs when the gas released from the heated biomass meets the additional oxygen supplied at the top of the stove.

Information for consumers

<table>
<thead>
<tr>
<th>Pot capacity (min/max)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate lifetime</td>
<td>3 years</td>
</tr>
<tr>
<td>People fed (min/max)</td>
<td>1 / 6</td>
</tr>
<tr>
<td>Pot type accommodated</td>
<td>Flat bottom</td>
</tr>
<tr>
<td>Common foods cooked</td>
<td>Asian meals that cook in under 40 minutes</td>
</tr>
<tr>
<td>Does it come with a manufacturer’s warranty?</td>
<td>No</td>
</tr>
</tbody>
</table>

Deployed in

Viet Nam

General information

Manufactured in

Viet Nam

MSRP (min/max) USD 16.00 / USD 20.00

Dimensions (l/w/h) 300 / 300 / 450 mm

Weight 3.0 kg

Shipping dimensions (l/w/h) 300 / 330 / 450 mm

Shipping weight 3.0 kg

Can it be assembled locally? Yes

Materials for local assembly Stainless steel cutting and wielding capabilities

Other information
Apon Chulha

Eco Stories

Fan fed TLUD designed for rice husk. They are very popular and are sold in large numbers without subsidy. Works great as an automatic rice cooker with 3 cups husk for 1 cup rice. A fan delivers a small amount of air to the bottom of a biomass cylinder and a large amount of oxygen at the top of the cylinder. This heating of the biomass in a low oxygen environment results in the production of charcoal (biochar) and a large amount of smoke. This smoke is then burnt in the plate of fire which occurs when the gas released from the heated biomass meets the additional oxygen supplied at the top of the stove.

Information for consumers

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pot capacity (min/max)</td>
<td></td>
</tr>
<tr>
<td>Approximate lifetime</td>
<td>4 years</td>
</tr>
<tr>
<td>People fed (min/max)</td>
<td>2 / 12</td>
</tr>
<tr>
<td>Pot type accommodated (Flat bottom/Round bottom)</td>
<td>Both</td>
</tr>
<tr>
<td>Common foods cooked</td>
<td>Rice, all kinds of curry, flat bread, tea, etc.</td>
</tr>
<tr>
<td>Does it come with a manufacturer’s warranty?</td>
<td>Yes</td>
</tr>
<tr>
<td>Warranty details</td>
<td>1 year replacement warranty</td>
</tr>
</tbody>
</table>

Manufactured in Bangladesh

Can it be assembled locally? Yes

Materials for local assembly

Other information