INTERNATIONAL CENTRE FOR ENERGY, ENVIRONMENT & DEVELOPMENT

TECHNICAL DETAILS OF THE DADIN KOWA STOVE

- ***how they're constructed (what design, what materials)***

The stove is designed along the principles of rocket stove technology where the height of the firebox is thrice the height of the firewood inlet. Using this principle to design a stove works very well for flat bottomed pots. However, the predominant pot in use in northern Nigeria (including north east Nigeria is the locally produced round bottomed aluminium cast pot (see Figure 1). Going by the nature of the pot, the stove adopted the rocket stove principle with some modifications to accommodate round bottomed pots. It has the following characteristics:

Figure 1: Nature of pot being used in northern Nigeria where the stove is being promoted

1. combustion chamber that accommodates wood sizes of at most 5cm x 3cm x 40cm

2. firewood inlet that accommodates up to 2 lengths of wood as specified in (1) above

3. Ratio of height of firewood inlet to combustion chamber height 1 : 2.3. This allows for more direct flames to get to the pot due to its shape and thickness.

4. Instead of maintaining uniform cylindrical shape along the entire height of the firebox which is associated with rocked stoves, the remaining one third is shaped like a cone (see figure 2). This has 2 advantages. The first is that it allows for the accommodation of round bottomed pots which is the predominant pot shape in use in northern Nigeria. Second is that it allows for uniform spread of heat to all parts of the bottom of the pot.

5. 8 - 9 symmetrical air holes are provided on the bottom of the combustion chamber. This ensures optimum supply of oxygen leading to better combustion and draft, and significant reductions in smoke emissions.

6. The stove is produced from a mixture of clay and saw dust (all sieved to remove coarse particles) in the ratio 2 : 1 by volume. There have been experiments on increasing the ratio of saw dust to getter better insulation but the resulting mixture was difficult to form.

7. Metal cladding made from at least 0.5mm mild or galvanized steel sheet and a robust handle from same material.

8. A later design incorporated the use of metal based pot rest (see figure 5). This was as a result of complaints from a number of customers that the ceramic based pot rest sometimes break in transit.

9. The stove named "Dadin Kowa (good for all)" can be used without metal cladding. However the one with metal cladding ensures added physical support.

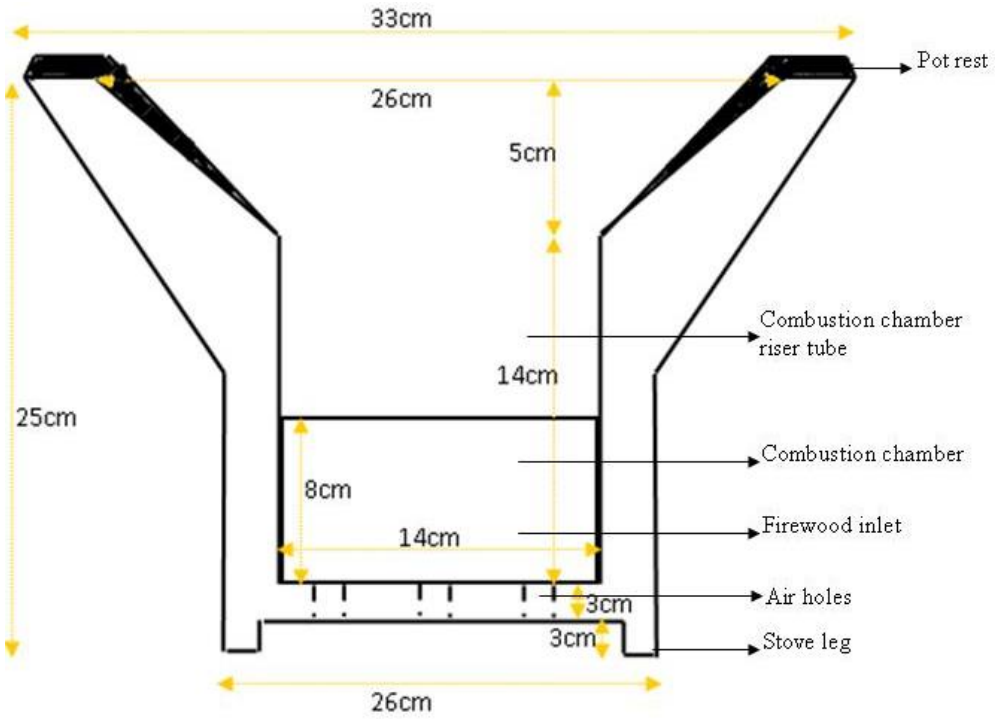

Figure 2: Drawing and dimensions of the stove

Figure 3: The stove without metal cladding

Figure 4: The stove with metal cladding

Figure 5: Later stove model with metal pot rest

Benefits of the stove

The stove offers the following co-benefits:

Health - According to the World Health Organization, 95,300 Nigerian women and children die annually because of indoor air pollution as a result of smoke from cooking fires[1]. The current cramped living conditions of majority of persons affected as a result of the insurgency in Borno State This stove reduces harmful emissions by at least 70% thus reducing the incidences of deaths from the kitchen.

Economic - The National Bureau of Statistics in 2010 estimated that 95% of households in Borno State rely on primarily on firewood for cooking and this was prior to the insurgency. Of percentage, 10% bought the fuel at that time[2]. The insurgency has greatly affected the availability of firewood in major towns and villages in Borno State. A rapid assessment conducted by ICEED and Mercy Corps in 2017 across Biu, MMC, Jere, MAFA, Damboa, and Hawul LGAs showed that the average cost of firewood is ₦20 per stick (300g). A medium sized family in these areas needs at least 10 sticks (3kg) to cook per day resulting in firewood consumption of ₦200 per day or ₦6,000 per month. Other alternatives like kerosene, LPG and electricity for cooking are either in short supply or more expensive. For an average family which most times depend on aid for survival, the fuelwood expenditure is quite high. The proposed stove saves at least 60% firewood[3] thus saving families monies that could go to better nutrition and other needs.

Environment - From the firewood consumption data recorded in ICEED/Mercy corps rapid assessment, average annual consumption per family will be 1,095kg or 1.095 tons. This is equivalent to about two trees of 10 inches diameter 40 feet long[4] to be consumed by one family per annum. Considering the percentage of families that depend on this resource for fuel, it is no wonder that the forest cover is being rapidly eroded. Introducing the Dadinkowa efficient woodstove will reduce this quest for firewood by 60% thereby slowing down the rate of deforestation and desertification. With adequate penetration of the stove, it is possible to strike a balance in the near future where woodfuel supply exceed demand and the forests will have a chance to regenerate.

Climate change mitigation - The stoves being proposed saves on average 1.1 tons of CO_2 equivalent per annum. Cumulative emissions savings from mass disseminated stove will be quite significant. This has the potential to also make poor families part of climate change mitigation.

[1] World Health Organization, National Burden of Disease Estimates 2010
[2] NBS-CBN-NCC Collaborative Survey, 2011
[3] Attached report of stove tests conducted under an EU funded project in Katsina State
[4] https://www.ncrs.fs.fed.us/pubs/ch/ch01/Chvolume01page401.pdf