

Cookstoves - Shaping health, environment, and tomorrow

Written by Amrita Das, Manager – Energy and Biomass

Cooking is an important part of our daily lives, but the traditional methods we often use can harm the environment. In today's world, where energy efficiency and environmental conservation are paramount concerns, it is essential to address the environmental implications of traditional cooking methods. According to the 2011 Population and Housing Census, surprisingly 86% of households in rural and 22% urban India still rely on biomass such as firewood, crop residue, and cow dung for cooking. This reliance on traditional stoves is primarily due to factors such as the availability of free biomass, limited affordability and availability of LPG fuel, and specific cooking needs.

To meet the increasing demand for fuel-efficient cooking solutions that align with the daily lives of users, various stakeholders in India have been actively involved in promoting "Clean Cook Stove/Smokeless Stove Initiatives" for more than 20 years. Since the year 1993, TIDE has been working towards providing women centric clean cooking solutions while prioritizing easy, reliable, economical and steady access to these stoves, rather than providing a high efficiency but difficult to sustain solution. These improved cookstove developed by TIDE has been replacing the traditional stoves in the step-by-step journey in transition to the better cookstoves. However, comparing the efficiency and usability of different cookstove designs is a challenging task, and there is no standardized test process. To address this, a comparative research study was conducted on two types of improved household cookstoves: Sarala stove and a factory-made single pan, metal portable stove.

Sarala cookstove, adapted by TIDE from design developed by IISC Bangalore, is a stationary, in-situ, two-pan stove that uses mud as a major construction material. Over the years, research and development activities have helped enhance the combustion chamber size, optimize airflow, and improve the overall performance and efficiency of Sarala cookstoves. These

advancements maximize fuel utilization, enhance heat transfer, and reduce heat loss during the cooking process.

In the controlled cooking test conducted as part of the research, on average, Sarala cookstove consumed 75.2 grams less equivalent dry firewood compared to the single pan, metal portable stove. Additionally, Sarala cookstove's specific fuel consumption was 21.5 grams lower to cook a kilogram of food compared to the portable metal stove. Both stoves offered similar cooking times, ensuring meals were prepared within 45 to 50 minutes. However, Sarala cookstove consistently produced an average of 13 grams less charcoal, indicating its ability to maximize the energy potential of biomass fuel and achieve better combustion.

While Sarala cookstove may have a lower absolute thermal efficiency compared to other cookstove products in the market, this comparative study revealed that it offers 21% higher biomass use efficiency than the single pan, metal portable stove. This reduction in biomass use is particularly significant in areas where firewood is the primary fuel, providing relief to communities, especially women who are the primary wood collectors. In regions with human-animal conflicts, Sarala cookstove stands out as an attractive option.

Moreover, Sarala's conventional mud stove model has been widely accepted and extensively used by communities, as it does not require drastic changes in their cooking practices. With proper usage and basic maintenance, Sarala cookstove has an extended lifespan of 10 years and beyond. The inclusion of a chimney in Sarala stove facilitates the release of smoke from the indoor environment, whereas portable metal stoves lack this feature, resulting in indoor air pollution or necessitating outdoor cooking. Household air pollution is responsible for 3.2 million deaths annually as per WHO 2020 data¹. The reduction of indoor air pollution with Sarala's usage also leads to long term financial benefits such as reduction in medical expense due to respiratory, skin

¹ WHO report of 28 November 2022 on Household air pollution, <https://ow.ly/1SB850P5tCs>

or other diseases related to poor IAQ, saving expense on need of white-washing walls every year, which become sooty with traditional stoves in use.

In addition to its environmentally sustainable, socially acceptable design and financial benefits, Sarala cookstove proves to be holistically profitable for rural communities due to its community-based approach. TIDE's cookstove programs begin with awareness sessions and stove-building training for short-listed women and men. This empowers them to become self-reliant and contribute to their family income, with the acquired skill serving as an option for secondary income generation. Compared to factory-made portable cookstoves, Sarala's organic and robust approach makes it more applicable and aligned with the principles of sustainable development goals and energy efficiency promotion. Sarala cookstoves continue to stand as a reliable and efficient solution for achieving these goals while also generating livelihood opportunities in communities.