

# IMPROVED COOK STOVE

## (From Smoke to Smile)

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**Abstract:** Small emissions from each of the millions of cooking stoves now form into Atmospheric brown cloud, leading to climate change, global warming and other impacts. Direct burning of biomass through traditional stove creates indoor air pollution. This paper deals with the basics of improved cook stove technology as well as introduced to the programme implemented by Ministry of New and Renewable Energy (MNRE), Govt. of India. Few points are also suggested which are barriers in implementation of Ministry's programme.

### 1. Introduction:

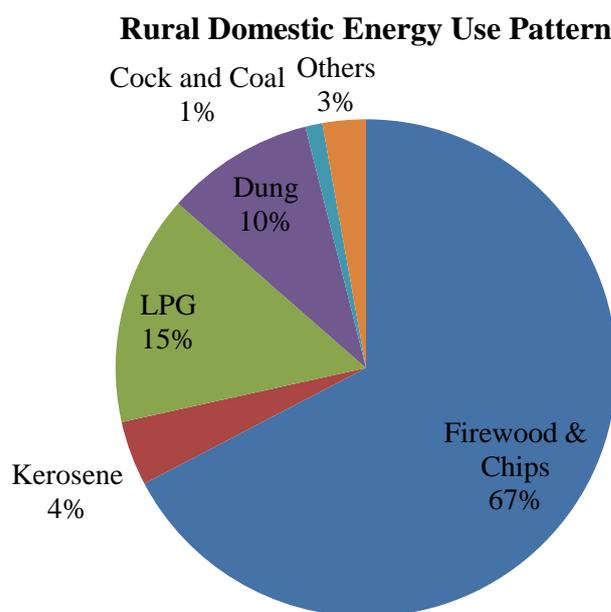
Use of biomass through direct combustion is a traditional method and is still under utilization. Cow dung cake is one of the most important and widely used biomass for producing daily energy needs. Estimated numbers of 2.5 billion people around the world are not being able to access the modern fuels till date. They are highly dependable on locally available wood and cow dung cakes. About ninety percent of the rural households in India use traditional biomass-wood and dung-as a household fuel each year. In 2009, UN Women Watch revealed, on average women and girls spend 20 or more hours a week trudging through dangerous and isolated areas in order to collect fuel for their cooking needs [1]. In India, more than two-third (67.3%) of rural households use firewood and chips, followed by LPG, used by 15.0% households. Only 9.6% and 1.1% of the rural households used dung cake and coke & coal, respectively, as primary source. 1.3% rural households did not have any arrangement for cooking as shown in figure.1. [2].

Burning of biomass or cow dung cakes through direct combustion creates smoke which consisting particulate matter (PM), carbon monoxide, nitrogen oxide, sulfur oxide, poly-aromatic and other hydrocarbons and various organic substances [3]. These pollutants are contributing to serious health problems as shown in Table.1, cancer and respiratory infections. Use of biomass in Indian households is causing premature deaths in nearly half a million cases and 500 million cases of illness each year because of exposure to smoke emissions. This makes indoor pollution the third leading health risk factor [4]. So it is imperative to replace traditional and inefficient chulhas by fuel efficient and environment and health friendly device to conserve fuel wood. This will result into improvements of health and hygienic conditions, cut in drudgery for women and children and to improve overall quality of life [5].

**Table: 1. Health effects of pollutants produced by incomplete combustion of solid fuels**

Pollutants	Associated health effects
Carbon monoxide (CO)	Binds to hemoglobin thereby interfering with flow of oxygen Causes headache, Nausea and Dizziness Leads to low weight at birth Results in increase in perinatal deaths
Particulate matter	Causes irritation and oxidative stress producing lung and

	airway inflammation, hyper-responsiveness, and in the long run, exposures to airway remodeling and emphysema. Causes reduced mucociliary clearance and macrophage response Is carcinogenic
Nitrogen oxide (NO <sub>2</sub> )	Causes irritation, affecting the mucosa of eyes, nose, throat, and respiratory tract Increases susceptibility to infections because of increased bronchial reactivity, longer-term exposure
Sulphur dioxide (SO <sub>2</sub> )	Causes irritation, affecting the mucosa of eyes, nose, throat, and respiratory tract
Lower molecular weight PAHs (1,3 butadiene, benzene, styrene, and formaldehyde)	Is carcinogenic



**Figure.1. Rural domestic energy use pattern**

**2. Improved Cookstoves:**

Biomass cookstove is a combustion device, use of which burns biomass fuel more efficiently with reduced emissions and offers cleaner cooking energy solutions. Fixed and Portable are the two basic types of Biomass Cookstoves. The portable cookstoves are also of two types; natural draft and forced draft. Advanced cookstoves using fans are more efficient cookstoves compared with natural draft ones. Cookstoves are categorized into domestic (up to 3 kW) and community (3-10 kW) as per their power output rating. The improved cook-stoves are fabricated using metal, ceramic and terra-cotta/pottery (durable type) and combination of that. With this, the stoves will be categorized as metallic (MS, SS, cast iron and combination thereof), metal clad ceramic/ pottery and ceramic types. IS 13152:2013 (Part I) specifies material specifications, material thickness and grades of material for portable metallic cookstoves. It incorporates testing methodology, pre-requisites and testing equipments as per Bureau of Indian Standards.

### 3. National Biomass Cook Stove Programme:

In the context of concerns over health, climate change and energy security, the Ministry of New and Renewable Energy through a Special Project on Cook stove (SPC) during 2009-10 initiated the process of consultations under its Core Group on cook stoves to ascertain the status of various types of biomass improved cook stoves being developed and promoted by various organizations, NGOs, entrepreneurs and industries in the country, and to identify ways and means for the development and expansion of the deployment of improved biomass cook stoves. The consultations indicated that biomass cook stoves do have the potential to directly address health and welfare concerns of the weakest and most vulnerable sections of society. The cleaner combustion in these devices will also greatly reduce greenhouse pollutants [5].

### 4. Suggestions for implementation of National Biomass Cook Stove Programme:

Government provides capital subsidies for competitive household fuels, such as LPG and Kerosene, which leads to price distortion in the domestic fuel use. The distribution network for LPG and Kerosene is inefficient. Governments can assist in formulating a policy framework, which provides incentives to private sector operators, women's self help group to engage in the production, distribution, and sale of improved stoves.

#### I. Trainings Programme under NBCP:

- a. **Fabrication cum Maintenance training programme** could be organized for self employed workers, fabricators and various field functionaries to create a cadre of technicians in fabrication of BIS improved cook stove models.
- b. **Orientation programme** can improve exposure of officers of the implementing agencies at field level. These programmes could be organized at decentralized manner at state, divisional, district and village level.
- c. **Awareness Programme** can raise awareness about the benefits of biomass cook stoves among user's specially women beneficiaries.

#### II. R&D and Technical Support:

A network of Biomass Cook Stove Testing and Training Center must be created under NBCP for providing technical and training inputs in addition to R&D work. The major thrust area in cook stoves are development of high efficient portable cook stoves and reduction in unit cost through innovative design and alternate material.

**III. Publicity:** in order to create awareness about the benefits of improved cook stoves, a mass publicity programme has been undertaken through the electronic and print media and radio at a central level. Decentralized publicity through hording, posters, audio-visual aids and other traditional methods should be undertaken.

**IV. Evaluation:** A multi step evaluation procedure could be followed by state implementing agency to obtain feedback on the field performance of improved cook stoves. Output of this study gives functionality of cook stove and success rate of technology and demand of year wise improvement.

### 5. Economics

Apart from qualitative benefits, an improved cookstove consumes much less fuel than a traditional cook stove. The thermal efficiency of a traditional cook stoves ranges from 8-12% while an improved cook stove has a range of 25-32%. Thus a traditional cook stove consumes 2000-2500 kg of wood per annum for an average family while an improved cook stove consumes 800-1000 kg. This means half the consumption compared to a traditional stove. If a lower average figure of 1000 kg of wood (valued at Rs. 2000) is taken as saving per annum, the average cost of Rs. 1500 for an improved cook stove could be recovered in just one and half year.

## 6. References:

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Plate.1. Exposure visit of Staff (NGOs) at MPUAT, Udaipur (January 2016)



**Awareness Campaign at MPUAT's adopted village Chhali, District- Udaipur (2015-16)**



**Plate.3. Heap of dung cakes**

