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## A STUDY ON ACCEPTABILITY & UTILITY OF SARALA STOVE (SMOKELESS COOK STOVES) 5 YEARS POST PROJECT IMPLEMENTATION IN GUBBI TALUK

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### ABSTRACT

*One of the objectives of MGIRED is to create awareness among stakeholders on the efficient use of conventional energy sources and its conservation by undertaking various activities like training, research, consultancy and implementation. On these lines MGIRED took up a project on construction of smokeless stoves in coordination with Technology Informatics Design Endeavour (TIDE) with financial assistance from Petroleum Conservation Research Association (PCRA). The project intended to construct 1470 smokeless stove of which 380 stoves, limiting to the amount released, were constructed in first phase during the year 2008-09 in the villages of Gubbi Taluk. From the study it is observed that the acceptance of the stove among the rural women has been very good which has reduced their drudgery and exposure to kitchen air pollution. The speciality of this project is that the rural women with entrepreneurship qualities were selected and trained to construct the stoves, who have constructed all the stoves of the project and earned additional livelihood.*

**Key words :** *Smokeless Stove, Firewood, Reduction, Rural Women, Health.*

### INTRODUCTION

The Census of India (2011) estimates that about 668 million people depend on traditional biomass and traditional cookstoves for cooking. Research indicates that the energy poor are also income poor. A World Bank study suggests that in rural India 57% of the households are energy poor vs. 22% that are income poor.

There are also serious health issues around cook stoves. Emissions from traditional cook stoves are a major health hazard. Latest health data from WHO estimated that 4.3 million people (worldwide) die annually from household air pollution caused by cooking with biomass and coal. It is the greatest health risk in the world after high blood pressure, tobacco and alcohol. Health and social impacts from the traditional form of cook stoves

are still affecting the underprivileged. Women and children suffer most because of indoor pollution as well they are the one spending more time in collecting fuel. Small emissions from each of the millions of cooking stoves form into Atmospheric Brown Cloud which is a layer of polluted air containing micro particulate matters emanating from incomplete combustion. Such mass of soot formed in atmosphere comprising toxic pollutants like carbon monoxide, nitrogen dioxide, volatile and semi-volatile organic compounds travels around the earth like a cloud and absorbs as well as scatters incoming solar radiation, leading to global warming and other impacts. Solid fuels primarily used for cooking causing indoor pollution is responsible for more than 1.6 million premature deaths all worldwide of which 4.00 lakhs in India alone per year. There are many studies that have documented the direct health hazards of acute and chronic nature like premature deaths, hospital admissions and chronic respiratory diseases. In most of the developing countries fuel generated by agricultural residues and organic wastes including wood and biomass fuels are still the primary source of energy for cooking and heating. In rural house holds 82% use biomass as cooking fuel comprising 76% of wood and chips and 6% of dung cakes. 12% of them use LPG and 0.79% use kerosene. The resulting exposure to air pollution causes an estimated 4.5% of the global burden of all the human diseases. Definition of an improved stove is a relative concept, which depends on several factors like the type of traditional stove considered, the aim of the design improvement and issues of affordability. These stoves can be designed to improve energy efficiency, remove smoke from the indoor living space, reduce fuel quantity or lessen the drudgery of cooking.

Earth's climate is also at risk from the smoke, which contains soot particles (black carbon) that absorb sunlight, alter atmospheric patterns and hasten glacial melting. In India, one-quarter of the fine particulate matter in the ambient outdoor air originates from household cooking-stoves.

There are very few national policies and programmes on household energy. At the National Level the National Biomass Cookstove Initiative has been launched. One of the components of the National Action Plan on Climate Change, is the Green India Mission where there is a mandate to increase biomass cover in forests by reducing use of firewood for cooking. At the state level, the forest department of the Govt. of Karnataka has been supporting efforts by allocating budgets for construction of Sarala stoves by women stove builders.

## **ADVANTAGES OF SMOKELESS STOVES**

- ☞ Reduction in the quantity of fuel used.
- ☞ No smoke is emitted during cooking.
- ☞ Reduction in time spent on cooking.
- ☞ Reduction in soot deposition on vessels.
- ☞ Locally available biomass can be used.
- ☞ Easy maintenance.
- ☞ The kitchen walls remain clean.
- ☞ Promotes good health of the family.
- ☞ Use of firewood saves kerosene and LPG.
- ☞ Faster cooking helps women to save time to take up income generating activity.
- ☞ Prevents in-house pollution
- ☞ Women can learn constructing of these stoves and earn income.



*Trained rural women constructing the sarala stove*

## **Challenges in dissemination of cookstoves and addressing cooking energy needs**

Most of the challenges in addressing cooking energy needs of poor rural households stem from the fact that there is a mismatch between the cooking energy needs of women and what the improved cookstove has to offer. Most improved cook stoves in the market are designed by international experts and suitability criteria applied are designed to address issues like climate change & deforestation. Whether the improved stove can cook a traditional Indian meal is not considered in the design process.

Improved cook stoves also require use of prepared fuel like biomass pellets. Besides the fact that fuel distribution chain for the same is not in place, the cost of fuel pellets is three times the cost of firewood sold locally. Purchase of firewood for cooking is not a practice as fuel for cooking is locally collected agro residue, collected twigs etc. So the market driven approach may not necessarily achieve scale in the short term and there is a serious need to explore alternatives for energy security and protect rural women from exposure to smoke.

Sarala stove is ideally suited as a low cost, smokeless stove for Karnataka and it has been in small scale dissemination through women stove builders for about 8 years now. This project aims to introduce new features into the dissemination strategy by combining the

stove construction programme with tree plantation and awareness creation.

### About Sarala Stove

The Sarala stove is a two pan wood or biomass burning stove. It was originally developed by Prof K.S. Jagadish at the Indian Institute of Science. It is a mud stove and has a few steel/cast iron components like grate, fuel feeding guiding frame, support rods between first pan, second pan and chimney entrance. A cement or GI pipe expels smoke from the kitchen. Its heat utilization efficiency ranges from 20 -22% depending on size of vessels and usage. Women report that it saves 30% fuel, saves cooking time by 25%, is completely smokeless and safe. To ensure that there is no randomness or variation in sizes during construction leading to rejection and reduce skill levels in construction the stove builders are trained to build the stove using a mild steel mould into which mud and bricks are packed.

Approximate cost for construction including labour and raw material would be Rs.800/- (as on 2015) of which Rs.100/- would be contributed by the beneficiary.

### Material required for one stove

Smokeless stoves help to convert a smoke full kitchen into smoke free clean kitchen by complete combustion of fossil fuels turning all carbon in the fuel into carbon dioxide and also in turn smoke free village. These 2 pan stoves are constructed with locally available raw materials like mud and bricks with help of a cast iron mould, 4" diameter 10' long ACC pipe plastered with cement or cow dung.

A stove takes 3 hours to build and can be used within 4-5 days after it is built. All kinds of loose and woody fuel can be burnt in this stove.



*Freshly constructed Sarala stove*



*Women Constructing the Sarala Stove*

### *Impact study of Sarala Stove implementation*

<b>Sl. No.</b>	<b>Materials required</b>
1	4" diameter, 10 ft length ACC pipe 1
2	6"x6" Cast Iron grate 1
3	Mud/Soil 15 Vessels (Bandli)
4	Sand 5 vessels (Bandli)
5	Red tiles 4 pieces & Bricks 25 & Fuel feeding frame (grate) 6"x6"x6"(I_I) 1.

## **PROJECT IMPLEMENTATION**

In the year 2008-09 a proposal was submitted to Petroleum Conservation and Research Association (PCRA) by MGIRED to implement a project on construction of 1470 smokeless stoves in 30 villages. The proposal was approved & Rs.3.04 lakhs was sanctioned. An amount of Rs.76,000/- was released first instalment as to construct 380 stoves @ Rs.200/- per stove.

Under this project, women were first trained to construct Sarala Stoves, who had further take it up in the houses of other beneficiaries as an entrepreneurship activity. Thus there was skill improvement combined with additional income generation.

This project was implemented in coordination with TIDE. Initially survey was conducted in six villages of Gubbi taluk to identify beneficiaries interested in the project and women willing to replace the existing cookstove in their kitchen with improved cook stove. These women were convinced that compared to traditional stove models, Improved cook stoves can provide superior performance by burning biomass energy more cleanly and efficiently. As a result, indoor pollution from cooking smoke will be reduced, helping to mitigate respiratory and other diseases of rural women. In addition, less time will be required for cooking meals and collecting biomass fuels, allowing women and other family members more time for educational, cultural, social, entertainment and other productive activities.

**The final number of house hold selected in these six villages of Gubbi taluk are as follows:**

- 1) Shivasandra 66 houses
- 2) Sigehalli 40 houses
- 3) Thaggihalli 78 houses
- 4) Yellapura 52 houses

- 5) Mudalapalya 72 houses
- 6) Kundrenahalli 72 houses

With assistance of TIDE, women trained in construction of Sarala stoves were assigned the job of constructing 380 smokeless stoves. The project was executed in six months with full support by the beneficiaries by way of providing labour and raw materials from November 2008 to April 2009. For the balance 1090 stoves, proposal was resubmitted by MGIRED to PCRA with estimated cost of Rs.14.08 lakhs, which was approved. However, funds were not released by PCRA and the project was subsequently closed prematurely. Hence this noble project could not be completed in toto.

In the year 2015 MGIRED felt the need to study the present usage and effectiveness of the project, i.e. after a period of six years, in order to replicate the project in other villages.

## METHODOLOGY

A questionnaire in Kannada was framed to elicit information from the beneficiaries. MGIRED Faculty and staff alongwith Senior Project Manager from TIDE formed a team and visited these villages to collect data on 08/05/2015 and 02/07/2015. The study team tried to contact all 380 households, however only 309 households could be contacted and surveyed.

The questionnaire had following questions tabulated into data sheet in order to infer the information and draw conclusion.

- 1) Using sarala stove - Yes/No
- 2) If yes fuel consumption in kgs before and after.
- 3) Time for cooking in hrs before and after.
- 4) Reduction of smoke - Yes/No
- 5) Improvement in health - Yes/No
- 6) Present condition of stove - Good/Not good
- 7) Repairs done - Yes/No
- 8) What type of repair?
- 9) Will you recommend to others?
- 10) Any suggestions
- 11) Training under gone.

## **RESULT & DISCUSSION**

It was observed that all the beneficiaries experienced reduction in smoke and improvement in health after switching over to sarala stoves. Out of 309 households covered during the study 20.71% of households did not face any problems or repairs in 5 years whereas 79.28% of households reported repairs of which 99.18% cases were cracks & 0.8% were chimney pipe damage. It was seen at the time of visit to their kitchen that everyone had taken care of maintenance by way of plastering the stove with cowdung/mud and cleaning the smoke pipe. Hence the present condition of stoves was good in all households, though the estimated lifespan of the stove is in general about 5 years. All of them expressed that they would recommend others to construct smokeless stove in their kitchen to enjoy its benefits, such as better health on account of no smoke, lesser cooking time required, lesser fuel required and lesser hardship of collection of firewood as compared to conventional stoves. It was told by all of them that they have not undergone any further training in construction or maintenance after the completion of the said project.

None of them had any suggestions to improve the present structure of the stove. With respect to consumption of firewood before installing sarala cook stove it was about 6 kgs on an average per household for a family size of 4 members for their old conventional stove and after installation it was found that it was reduced to about 4 kgs on an average per household which works out to a saving by 33%. Similarly number of hours spent for cooking before installation of improved cook stove was about 3 hrs on an average per homemaker and after installation of improved cook stove it came down to about 2 hrs on an average per homemaker, which works out to 33% saving in time. Hence, the study proves that any house hold can save upon their firewood consumption, also save cooking time and prevent rural women from exposure to indoor air pollution after installation of improved cook stoves.

### **Continuation of this programme by MGIRED**

Construction of Smokeless Chulas has a multi faceted objective. Apart from enhancing the quality of life, of rural women, additional income generation activity will benefit the rural women. In addition to satiating the cooking energy needs there is significant savings in the time incurred for collection of firewood that is saved on account of efficiency of the stoves; safeguarding the health and longevity of rural women by preventing exposure to kitchen smoke; conservation of trees and thereby environment protection, etc. Though this is a win – win situation, it is seen that funding agencies are not giving enough importance

in funding such useful projects, on account of which the implementation of this green and cost effective technology has not reached more beneficiaries originally intended.

MGIRED is committed to and constantly putting efforts to continue to this programme. In this regard, we are trying to loop in various stakeholders across government, public sector corporations and private companies. Health, Social Welfare, Rural Development, Women & child rights, Energy, Forest and Environment departments can be associated in this programme as there is a common objective which is expected to yield fruitful results. Public sector Corporations, Agencies like PCRA, private companies like cement manufacturers, Infrastructure companies, etc have been approached for funds as part of Corporate Social Responsibility (CSR) activities. It is hoped that this philanthropic programme will be supported by all concerned keeping in view the welfare of rural women.

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### About Technology Informatics Design Endeavour (TIDE)

TIDE is a not for profit society working at the interface of science and society. Its work is largely in the area of energy access and biomass based stoves for cooking and other small, rural, informal industry applications. The stoves disseminated have also been designed or adapted for local convenience at TIDE. The grass root enterprises spun off by TIDE have so far constructed about 18,000 stoves, dryers and kilns to meet the heating needs of informal industries, Women stove builders have built 20,000 Sarala stoves (household cookstoves). Firewood saved by use of improved stoves is estimated at 30,000 tons annually.

