

## Viability of Improved Chulhas in Himachal Pradesh

### Chulha: The Traditional Stove

In Himachal Pradesh, the traditional stove used for cooking is called chulha. Chulhas are typically placed on the floor inside the home. The most basic form of the chulha is a bowl with a u-shaped slot. Chulhas are commonly constructed from a mixture of clay and cow dung. An example of a traditional chulha can be seen in Figure 1.



Figure 1. A u-shaped chulha

Note that there is no ventilation of the smoke produced from burning *biomass fuels* (1) within the homes. The main fuels used in chulhas are wood and cow dung, both considered biomass fuels. Biomass fuel types produce a wide range of *pollutants* (2) when burnt that can affect everyone inside the home, whether they are the ones cooking or not (UNDP, 1997). A more advanced chulha design can be seen in Figure 2. It is a hollow block with several openings allowing for multiple cooking surfaces. This design also includes an oven. Some more advanced chulhas include chimneys to help ventilate smoke out of the home.

The chulha's main flaw is its open fire cooking, requiring large amounts of wood to maintain cooking temperature. The more advanced chulha addresses this flaw, but has limited *airflow* (3). Chulhas have now been surpassed in design by other types of stoves that use cleaner burning fuel sources and are far more efficient.



Figure 2. An improved chulha

### Health Risks Associated with Burning Biomass Fuels

India's indoor air pollution is an environmental problem and a major health problem. In developing countries, biomass fuels burned in stoves within households create dangerous pollutants (Arora, 2014). Nearly 50% of the world's population and 75% of Indian households burn biomass fuels - primarily wood and *cow dung* (4) (Prasad, 2012). The *noxious* (5) gases produced from burning biomass fuels in high volumes is a primary contributor to indoor air pollution. The noxious gases also contribute to greenhouse gas emissions in northern India.

Biomass fuels are inefficient, meaning they must be burned in large quantities to maintain a cooking fire. The efficiency of biomass fuels when burnt in traditional chulhas is typically as low as 10-15% (Perez-Padilla, 2010). In other words, this means that up to 90% of the energy produced by burning biomass fuels is not used for cooking.

Women and children are at the greatest risk for health complications, as they are tasked with cooking in the home. There are many diseases and health effects caused by exposure to pollutants produced by traditional chulha use. Health effects include: chronic obstructive *pulmonary disease* (6) (COPD), *lung cancer* (7), tuberculosis, acute lower respiratory infection, and asthma (Perez-Padilla, 2010, and

Forum of International Respiratory Societies Report, 2016). Acute lower respiratory infections and asthma are the two main health complications seen in children. Unborn children in women exposed to pollutants can also develop health issues (Perez-Padilla, 2010). COPD and lung cancer can be diagnosed in individuals as early as 30 years of age. COPD is a major contributor to premature deaths due to smoke inhalation from burned biomass fuels. Lung cancer is primarily found in those who smoke tobacco products and cook with biomass fuels (Perez-Padilla, 2010).

### LPG Stoves – Increasing in Popularity

In Himachal Pradesh, LPG stoves have become the desired improved cook stove to use alongside traditional chulhas. In our visit to Bagi Village, where no families currently had access to LPG stoves (Figure 3), some families said they would prefer to use an LPG stove. It shows that the families knew about LPG stoves, but they simply did not have the means to acquire one. The PMUY social welfare act *subsidizes (8) LPG canisters (9)* for Indian households at an affordable rate. The goal of this act is to increase access to LPG cooking for households below the poverty line (BPL) (PTI, 2016).



Figure 3. A Liquefied Petroleum Gas (LPG) stove

In March of 2015, Prime Minister Shri Narendra started a campaign called “#giveitup” to persuade those who could pay market price for LPG canisters to give up their government subsidies (Indian Government, 2015). With the upper and middle classes giving up their government subsidies, more and more money was freed up in the national budget for the less fortunate (PTI, 2016). Government subsidies will help households transition from their use of

chulhas and biomass fuels to LPG stoves for cooking.

The PMUY act caters directly to BPL families and set requirements to ensure subsidies are exclusive to BPL families.

The PMUY act will be effective from 2016 to 2019 and is projected to influence over 5 million households (Jain, 2016). However, even with the current act and those that have come before it already in place, LPG stoves have not completely phased out chulhas.

A 2015 study has found that the rural population of Himachal Pradesh follows a system called ‘stove stacking’ (Wang, 2015). The basis of this system is the continued use of traditional biomass burning chulhas, alongside the use of the new improved cook stoves. While conducting surveys, we found that 63% indeed follow this practice of owning both an LPG and a chulha, a much greater percentage than we anticipated.

There are several different theories as to why LPG stoves have not completely superseded chulhas as the primary stove used by the rural population of Himachal Pradesh. One theory is that the rural population does not know the environmental and health effects of burning biomass fuels. The population assumes that renewably harvested biomass fuels do not harm their surrounding environment.

Additional theories take into account economic, geographic, and social factors that prevent LPG stoves from entirely replacing the chulha. Even with government subsidies, LPG prices can be still be too high for **BPL (below poverty line) (10)** families. According to a recent survey, 95% of BPL households without LPG connections cite their inability to pay as the main reason for not using an LPG stove (Jain, 2016). Most households survive on a subsistence level. The yearly income per household for the Himachal Pradesh region is about 1000 USD (India Census, 2015).

Another reason why LPG’s have not completely replaced chulhas has to do with the geography of Himachal Pradesh. Traveling in Himachal

Pradesh can be time consuming due to the mountainous terrain. Furthermore, during monsoon season, many roads become dangerous to the point that driving is not feasible.

Delivering LPG canisters to remote villages is always difficult and occasionally impossible (Jain, 2016). Availability and access can make the preference for chulhas over LPGs for a rural household easy.

Social factors also play into why the region has not converted to LPG stoves exclusively. Lack of awareness about the PMUY act is negatively impacting the conversions in the most rural areas of the region. About 40% of households in the rural regions of the country that do not have

LPG stoves entirely lack the information about the act and its benefits, or lack the information pertaining ways of obtaining a subsidized LPG connection (Jain, 2016).

Finally, LPG stoves can also fail to meet households' culinary preferences, which are tied to the use of traditional chulhas. The chulha is valued for its perception that food cooked on the chulha has superior taste, an opinion strongly held especially by elders (Wang, Y., 2015). This social factor can possibly explain why some households in Himachal Pradesh still retain a chulha even though they also own an LPG stove.

Adapted from:

Bansal, V., Bell, S., Gehring, T., Hoeckele, C. & Kushwaha, A. (2016). *Viability of Improved Chulhas in Himachal Pradesh* [Undergraduate Thesis]. Retrieved from: [https://web.wpi.edu/Pubs/E-project/Available/E-project-050217-015959/unrestricted/IN17-Chulha\\_report.pdf](https://web.wpi.edu/Pubs/E-project/Available/E-project-050217-015959/unrestricted/IN17-Chulha_report.pdf)

Comprehension Questions:

1. What is a chulha?
2. What are the environmental and health risks related to the use of traditional chulhas?
3. What solution has the Indian government chosen to address the “chulha problem”? What measures have been taken to implement this solution?
4. What are the social and financial challenges faced by LPG stove solution?
5. What other solutions could be implemented?
6. Find a definition for the 10 terms highlighted in italics.