

**Installing a “CleanEnergy-SafeEnergy” as an alternative cooking
Fuel in Kebribeyah Refugee Camp, Eastern Ethiopia
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1. Background

Gaia Association is an Ethiopian NGO formed one year ago to further the aims of Project Gaia Research Studies, which has as its purpose to demonstrate the use of alcohol fuels (ethanol and methanol) for household and refugee use in Ethiopia. The association seeks to replace existing traditional fuels such as firewood, kerosene, charcoal, and dung that have been shown to be harmful to human health. The vehicle for this change is the CleanCook stove by Dometic AB, which is fueled by ethanol. In 2006, Gaia Association became an implementing partner for UNHCR and plans were put in place to scale up the number of stoves at the camp, the overall objective being to fully supply the camp by the end of 2009. It is anticipated that a full scale up at Kebribeyah will capture the attention of the international development and humanitarian assistance community and serve as a model for replication elsewhere. To date, approximately 850 stoves have been installed in 850 households at the camp.

This clean cooking technology has had a hugely positive impact on the health and livelihoods of the beneficiaries. The stove has removed fuel wood smoke, which contains high levels of carbon monoxide and particulate matter, from refugees’ homes, thus improving the health of refugees, especially women, who are typically responsible for cooking. Moreover, women and girls using the stove report feeling safer as they no longer need to leave the camp to gather fuel wood, an activity which puts them at risk of rape, attack and injury on a daily basis. The time saved means that women and girls can engage in other, more productive activities such as education, income generation and childcare. In addition, the introduction of the CC stove has eased tensions between the refugee and settled communities since they are no longer forced to compete over the same scarce fuel resources.

Gaia Association has carefully monitored the impact of the clean cooking technology on the health and livelihoods of the beneficiary population. Indoor air pollution monitoring was carried out by the Gaia Association technical team to demonstrate the positive impact of the ethanol fuelled stoves on indoor air quality.

The Impact of Indoor Air Pollution on Health

Unlike kerosene and other traditional biomass fuels, Ethanol burns cleanly, without producing smoke or soot. This has obvious implications for household health. Ethanol does not emit pollutants such as Carbon Monoxide and Particulate Matter which cause respiratory infections, and are linked to Tuberculosis and Cancer. Moreover, ethanol, when burned in an appropriate appliance (such as the CleanCook stove), is extremely safe with no risk of explosion. These positive attributes make ethanol the ideal household

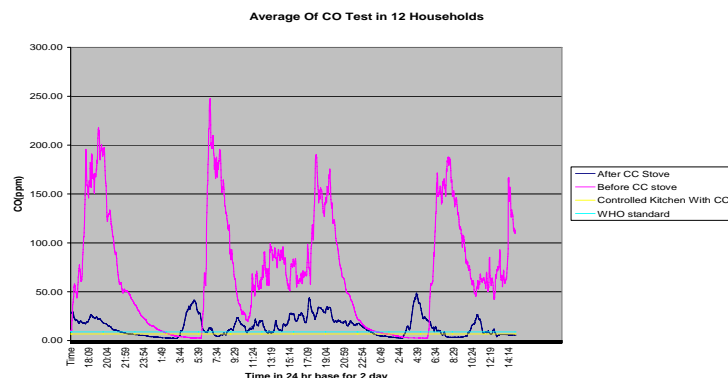
cooking fuel for compact living arrangements where a separate cooking area is not available.

Under the guidance of the Center for Entrepreneurship in International Health and Development (CEIHD), Gaia Association has performed indoor air pollution (IAP) tests for the past year in homes in Addis Ababa and refugee camps throughout Ethiopia. IAP in refugee communities is a major concern, and the data collected from this study will aid in the mitigation of the negative effects of indoor smoke.

Traditional cooking practices and housing structure contributes to high levels of IAP in the camp kitchens and homes. The front door is the only access to fresh air and most homes/cooking areas are poorly ventilated. The lack of ventilation adds to high levels of carbon monoxide (CO) and particulate matter (PM_{2.5}) in the air. Furthermore, the close proximity between homes contributes to PM and CO transference from one house to another. This transference of IAP is compounded by the frequent use of stoves within each home. Other factors that contribute to high levels of CO and PM in the camp are: incense burning inside the home, use of the kerosene lamp inside the home, and the arid climate.

Our IAP before (wood as the primary cooking fuel and charcoal as the secondary fuel) samples showed that heavy use of fuel wood combined with the lack of ventilation in the cooking structures resulted in very high levels of CO and PM. The highest levels that we recorded during the 48-hour period were 707.0ppm and 235.4 mg/m³ respectively. While these were levels recorded in a single household, they were not atypical of all of the households in the camp that we measured. Once the clean Cook was introduced, the CO and PM concentrations were significantly reduced by 91.1% (to 63.2ppm) and 89.8% (to 23.99 mg/m³) respectively in the household referred to above. Across our entire camp sample the before CO average was 68.2 ppm and the after CO average was 14.67, while the before PM average was 127.3 mg/m³ and after PM average was 51.6 mg/m³. Thus across the sample the improvement achieved for CO was 78.5% while for PM the improvement was 59.5%.

Profile of CO Gains Achieved in Homes in the Kebribeyah Refugee Camp during 48-h Test



Beyond the proven air quality improvement of the CC stove there are many social benefits. For example, women using the CC stove and ethanol no longer need to gather fuel wood, a risky activity involving leaving the camp and walking for up to 8 hours over rough terrain to gather fuel wood, with the return trip under a heavy burden. This work isolates the women and leaves them vulnerable to injury, assault and rape. Young girls are expected to assist with this work, and as a result, are often forced to drop out of school. Women and girls using the CC stove report that they feel safer now that they are no longer forced to make the dangerous journey out of camp.

Gender

The prioritization of ethanol as a household fuel will strengthen the position of women in Ethiopian society. With the reliance of the Ethiopian household energy sector on inefficient stoves and sub-standard fuels, it is women who are primarily exposed to indoor air pollution and unnecessarily long cooking times. Women in rural areas are forced to gather fuelwood, a time consuming and dangerous activity. The introduction of ethanol as a household cooking fuel will relieve women from all of these burdens and save their time which may be used for more productive activities.

Environment

Since the CC stoves are very clean burning, these stoves using will displace carbon emissions and GHG (CO₂, CH₄, CO and NO_x) from the traditional household fuels that are carbon-rich fuels and burn inefficiently in poorly designed or informal stoves. Airborne soot in the kitchen, courtyard and city environment, as well as that released to the atmosphere, will also be reduced. The use of the CC stove will diminish the need for fuelwood gathering and thus have a positive impact on the lives of women and girls with regards to personal safety and the opportunity to pursue other interests, including education.

Prior to the introduction of the CC stove and ethanol, households in Kebribeyah refugee camp were using an average of 2012 kg of firewood for cooking and 1677 kg for baking per year. The introduction of the CC stove and ethanol fuel has reduced or eliminated the need for firewood and although an environmental impact assessment has not yet been conducted, we can assume that this reduced demand for firewood has had a positive impact on the environment surrounding the refugee camp.

The ethanol powered CleanCook stove has brought clean and safe energy to Kebribeyah Refugee Camp. It is a proven technology that benefits the refugee population of Kebribeyah on many levels. As stated above the CleanCook is a clean cooking technology that not only provides the population with health benefits but also security for the women that walk countless hours to gather fuelwood.