IMA WORLD HEALTH

UKaid
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COOKSTOVES
in the Democratic Republic of Congo
ASSP and ASSR - 2013 to 2022

IMA'S JOURNEY TO DEVELOP A CLEAN COOKSTOVE FOR WOMEN IN DRC

BACKGROUND

IMA embarked on the development of a gasifier stove as a solution to multiple health, environmental, and socio-economic challenges. The principal goal was the reduction of Acute Respiratory Infections (ARI) in women and children due to inhalation of smoke while cooking. Additional goals included reduction of deforestation, the reduction of labor spent collecting cooking fuel and also cooking, and the improvement of family livelihood incomes through the sale of charcoal produced by the gasifier stove.

IMPACT ON HEALTH

One in 72 persons in the DRC die of illness due to excessive exposure to smoke. Pneumonia is the cause of 19 percent of the mortality of children under five years old. Nearly 50 percent of pneumonia deaths in children under five are due to airborne particles inhaled due to indoor air pollution. IMA addressed this challenge in the DFID funded ASSP project with research and development of a low particulate emitting gasifier stove intended to be widely disseminated in target health zones.

TREATMENT VILLAGES HAD 10% LESS ARI AFTER THE INTRODUCTION OF IMA STOVES

IMPACT ON THE ENVIRONMENT

A gasifier stove burns cleanly via the combustion of gasses emitted by heated wood. When done, the stove contains charcoal that can be used in a charcoal burning stove for additional cooking. Alternatively the charcoal may be sold or used as a soil amendment called *biochar* which improves retention of soil nutrients. Up to 80 percent of the energy in firewood is lost during conversion to charcoal depending on kiln efficiency. Efficiency of traditional earth pit kilns are estimated to be between eight and 12 percent efficient. Widespread adoption of IMA's gasifier stove by DR Congo's population that cooks with wood would result in significant reduction in deforestation and the release of greenhouse gasses. Normal household cooking with IMA's stove would produce 600 to 800 grams of charcoal a day from three

Left: women in Kasai Central carrying firewood for cooking.

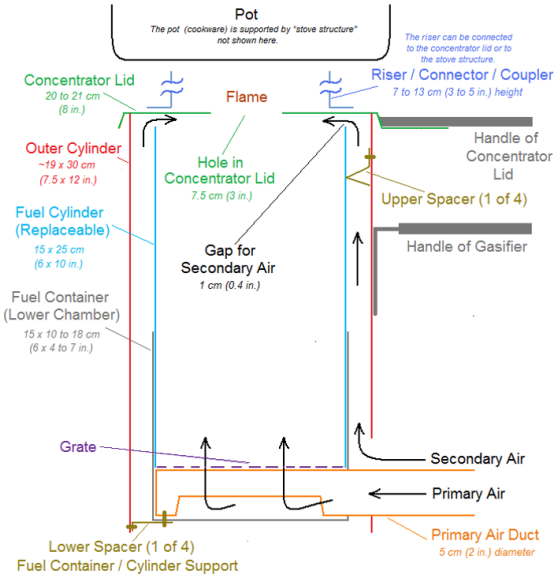
Right: Women in Mpoko village pose with their cookstoves.

to four kg of firewood. This translates to an average of one metric ton of charcoal produced per day for every 1,400 stoves in use. This would combat deforestation by displacing up to 12 metric tons of firewood that would otherwise be inefficiently converted to charcoal by traditional earth pits. The reduction in deforestation and charcoal production similarly reduces loss of biodiversity, decreases soil erosion, and promotes water infiltration supplying springs.

IMPACT ON LABOR, PARTICULARLY OF WOMEN

Globally, women and children can spend up to five hours a day collecting firewood or expend significant financial resources to buy firewood or charcoal. IMA's stove efficiently produces cooking heat from wood resulting in a charcoal byproduct. This efficiency translates into reduced amounts of wood needed to be collected and thus less time collecting wood. Because the stove burns wood in 'batches', once lit, the fire does not need to be tended as compared to a three-stone fire or a rocket stove, freeing the cook, usually women, to carry out other activities.

Figure 1. Diagram of a Gasifier Stove



IMPACT ON LIVELIHOOD INCOMES

In Congo, low-income urban and peri-urban families spend about 33 percent of their income on buying charcoal to cook their food. Rural families cook with wood. Because IMA's stove produces charcoal as a by-product of cooking, the charcoal is a new potential source of revenue for rural families. Similarly, peri-urban families that have access to wood can decrease their monthly fuel budget by burning wood and producing charcoal for sale.

PROJECT RESULTS 2013 TO PRESENT

RESEARCH AND DEVELOPMENT

In 2013 IMA began research and development into an appropriate Top-Lit UpDraft (TLUD) gasifier stove for DRC based on Paal Wendelbo's Peko Pe deployed in Uganda in the 1990s. In 2014 IMA distributed five different models of TLUD stoves to women's groups in Mpoko village in Nganza district in the Tshikaji health zone in the Kasaïs. Three months later, an IMA consultant conducted focus groups and surveys to determine the appraisal of these stoves: the advantages, disadvantages, and recommendations to users. Based on this work, IMA selected a stove design capable of holding a charge of up to 2.5 kg of dry wood and burning for 45 to 90 minutes The stove underwent efficiency testing at CERERK, a local stove testing lab, and based on results was adopted for manufacture and sale. CERERK tests certified the stove as Tier Three for thermal efficiency and Tier Four for PM 2.5 particulate emissions. IMA registered the design with the Secrétariat Général à l'Industrie in DRC under the name *Sala Makala* which means "charcoal maker".

CERERK tests took up to six weeks and rose in price to nearly $2000 per test. Hence IMA set up its own stove testing lab to get results on designs faster and cheaper. Stove testing is on-going resulting in insights as how the stove behaves with different fuels and how potential modifications may improve performance.

In September 2019 IMA contracted the Swiss Institute of Tropical Health to conduct research to document the health benefits associated with the use of IMA's Sala Makala stove by means of a repeated cross-sectional study and an analysis of statistics from health centers serving the intervention villages and surrounding populations.

The study included a baseline and endline household survey including a total of 300 households from four selected villages in the health zone of Tshikaji in the central-southern part of DRC. Sala Makala cookstoves were distributed to all households of two intervention villages, Kampanyanga and Lumu Katende, after the baseline. Data was collected in January and September/ October 2020. Complete data was obtained from 285 households in the baseline and from 282 households in the endline.

IMPACT Reduced ARI

The Swiss Tropical study documented "a majority of the self-reported respiratory symptoms were statistically significantly lower in the endline compared to the baseline, particularly in the intervention villages. These findings were supported by the analysis of DHIS2 data from the health center serving the study villages for the time period of 2018 to 2020, which indicated a 10 percent greater reduction of ARI between the baseline and endline in the intervention villages. Since the health center serving the intervention villages also served many people who did not have Sala Makala stoves, the full impact of using the stoves may be greater than what was found in this study."

Sala Makala stoves cook faster with no demands on tending the fire. The average meal takes 87 minutes and the average burn lasts 95 minutes.

Combats deforestation by displacing up to 12 metric tons of firewood that would otherwise be inefficiently converted to charcoal.

100% adoption rate in Mpoko village.

Three years later they are still using their stoves.

MASS PRODUCTION.

In September 2015, IMA recruited an engineer to set up a workshop in Kinshasa for the production of TLUD stoves. Subsequently tools were ordered for manual production of stoves followed by the purchase of sufficient steel sheet for the production of 8000 stoves. Donor funding dictated stoves be distributed in the Kasais. Hence the Kinshasa shop produced unassembled stove "flat packs" which were shipped to Kananga for assembly by local artisans. With only a team of four persons at each location, IMA attained production of 600 stoves per month.

ADOPTION AND SALES

In June 2016, 50 stoves were distributed in Mpoko, a village midway between Kananga and Mweka in the Kasais, where the initial focus group interviews took place. It was widely adopted and was still in use by 90 percent of the households three years later. Similarly, the Swiss Tropical Institute study reported "In the baseline, almost all the households used the traditional three stone fire and some single households a simple brasero as their principal cookstove. In the endline, almost 80 percent of the households from the intervention villages

of Kampanyanga and over 90 percent from Lumu Katende reported using the Sala Makala as their primary cookstove, which points to a very high adoption rate."

IMA proposed to the women of Mpoko to become vendors of stoves to households in neighboring villages with a commission of $3 per stove. Sales by women's groups in target villages in Kasais were just beginning when unrest broke out in 2016 causing entire villages to flee to secure areas. The unrest lasted nearly two years halting all stove sales efforts. Funding for the Sala Makala stove component ended with the ASSP project in 2019 releasing IMA to sell the stove anywhere in

DRC. Modest attempts to promote the stove in 2019 in Kinshasa were abruptly halted by Covid-19 restrictions.

OTHER FUNDING SOURCES

IMA is a founding member of Congolese Association for Decentralized Renewable Energy, or ACERD. IMA is also a member of the Congolese Cookstove Association which is related to the worldwide Clean Cooking Alliance. Both organizations are frequently contacted by donors wishing to fund improved stove initiatives and reduction in deforestation.

Osprey foundation remains a resolute supporter of IMA's cookstove program funding the Swiss Tropical Institute study and marketing efforts around Kinshasa. In 2021 Osprey funded the procurement of engineering services and of industrial presses to improve production quantity and quality. In 2022 Osprey funded efforts for IMA to register the stove with Carbon Credit agencies.

FUTURE ACTIVITIES

IMA remains determined to see widespread adoption of the Sala Makala stove in Congo. IMA will introduce a stove distribution component to all project proposals for which it is relevant. Osprey's funding for equipment will allow production at scale to meet a large demand. IMA is currently pursuing certification for the sale of Carbon Credits which should eventually make the stove project completely self-sustaining.

IMA Stove Sala Makala has been patented.

Marketing & advertising materials have developed including videos, posters, flyers, and roll-up banners.

Stock traceability procedures have been put into place.

PRODEK, our Kasai partner, is ready to relaunch sales.