



## Summary of Proposed Urban Stove Improvement Project for Uganda

**Title:** Efficient Wood and Charcoal Stoves in Uganda

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### Introduction

One of the major causes of deforestation in Uganda is charcoal making for urban domestic cooking. More than 95% of Ugandans continue to rely on solid fuels for cooking, typically a combination of charcoal and wood for urban dwellers and wood or agricultural wastes for rural households. A series of focus groups held in 2005 in three Kampala divisions concluded that the most common cooking device in these urban areas was the traditional metal charcoal stove, followed by the three-stone fire.

This project promotes sales of improved charcoal stoves initially in Kampala<sup>1</sup>, the capital of Uganda, and subsequently in the other towns of Uganda where charcoal is a common cooking fuel. Charcoal marketed in Kampala is sourced in many different parts of Uganda.

The project will provide high-quality, affordable stoves to replace inefficient traditional metal charcoal burners and three-stone wood fires. The improved charcoal models have been shown to reduce charcoal consumption in households by an average of 37 percent and are capable of saving more than half the fuel used previously. We will also offer a fuel-saving wood stove, with both domestic and institutional models, with a wood-savings on average of 58 per cent. These stoves will significantly reduce greenhouse gas emissions while simultaneously offering co-benefits to families in the form of relief from high fuel costs and reduced exposure to health-damaging airborne pollutants.

The project is based on pilot work by the Urban Community Development Association of Kampala, Uganda (UCODEA) in 2005 and 2006. Working with assistance from the Centre for Entrepreneurship in International Health and Development (CEIHD)<sup>2</sup>, based at the University of California-Berkeley in the USA, and support from the Partnership for Clean Indoor Air, UCODEA was able to sell on average 500 improved stoves a month in those two years. The stove technology was developed in this period, and stoves were sold in several sizes, with the smallest model retailing for \$8.

The dissemination process for both the charcoal and wood stoves indicated that a much larger market existed and there was potential for significant expansion of production and sales. Despite this potential the barriers faced were insurmountable; the technology development and sales had depended on temporary seed finance, which became increasingly difficult to obtain, and in addition, it was clear that improved marketing approaches, capacity building of various kinds, quality control, financing modalities, and other such costly requirements would be needed to realize the potential for an expanded market.



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<sup>1</sup> With regard to global warming mitigation, this project will be submitted for formal accreditation as a high-quality Voluntary Emission Reductions Project in the category of domestic energy efficiency. Due to its high costs of operation and the barriers faced, the project is dependent on carbon finance being available and its launch is subject to approval from the leading voluntary emissions standards bodies.

<sup>2</sup> UCODEA will continue to receive implementation assistance from CEIHD throughout the project period, through a new entity Venture Strategies for Health and Development (VSHD). The principal project implementer is VSHD, working in partnership with UCODEA.

The project is designed to facilitate sales in the first year of over 20,000 stoves, rising thereafter. Initially UCODEA will disseminate in Kampala, with extension to the other towns of Uganda in later years of the project. The charcoal stove is most applicable in urban areas, whereas the wood stove is expected to be more popular in peri-urban areas and close-in rural areas, as well as with institutional customers, who pay high fuel costs. The intention is to sell the stoves to the target market at a price that reflects their production costs (not including externalities related to marketing and quality control). This ensures a professional commercial relationship between the user and the disseminators. Included in the purchase price is a quality guarantee, and defective or broken stoves will be repaired or replaced for the lifetime of the stove, currently set at three years, but likely to be extended to five years as the project progresses. Finally, we anticipate that we will have sufficient carbon funds to offer existing customers an incentive to replace the stove at the end of its lifetime, likely in the form of a discount coupon or similar mechanism.

### **Sustainable Development**

The sustainability analysis assesses the project in terms of environmental and sustainable development impact. The relevant indicators are:

- Livelihood circumstances will be improved since the improved stoves reduce fuel costs. On average the improved charcoal stove will save a household approximately \$130 USD over three years, and the improved wood stove will save approximately \$50 over three years.
- Urban householders will have improved access to energy (37-58% more effect from the same fuel).
- The improved stove gives rise to employment opportunities for enterprises manufacturing, distributing, retailing, and maintaining the stove (though this is offset by reduced employment for charcoal makers and sellers)
- Human capacity is raised through the business development component of the project.
- The introduction of locally manufactured technology with optimized energy efficiency helps to build technological self-reliance.
- Mothers and children exposed to fewer hazardous air pollutants through reduced emissions of carbon monoxide and fine particles. Air pollution from cooking with solid fuel is a key risk factor for childhood pneumonia as well as many other respiratory, cardiovascular, and ocular diseases. Preliminary field data show that UCODEA's wood burning stove reduces carbon monoxide by 54% and fine particles by 49%.

No negative indicators arise from the project:

### **Greenhouse Gas Emission Reductions**

The project will reduce the amount of GHGs emitted during charcoal use as a domestic cooking fuel, by introducing widespread use of efficient charcoal burning stoves which will replace existing charcoal burning stoves. GHG emission reductions will come from reduced fuel use, less global-warming intensive combustion products (due to improved combustion efficiency) and avoided charcoal making and its related GHG emissions. The total reductions are estimated conservatively to be 1.28 million tonnes of CO<sub>2</sub> equivalent during the project period.

Years	Annual estimation of emission reductions in tonnes of CO <sub>2</sub> e
1.	26,235
2	78,704
3	131,174
4	183,643
5	236,113
6	288,582
7	341,052
<b>Total emission reductions (tonnes of CO<sub>2</sub> e)</b>	<b>1,285,503</b>
<b>Total number of crediting years</b>	<b>7</b>
<b>Annual average over the crediting period of estimated reductions (tonnes of CO<sub>2</sub>e)</b>	<b>183,643</b>

### Additionality

The UNFCCC Additionality Tool (Version 2) requires that five steps are taken to investigate whether or not the reductions would be obtained in the absence of project activity. These five steps are taken in turn below.

1. *Singular compliance: is this project the only one alternative that is in accordance with legislation and regulations with which there is general compliance?* The three alternatives prescribed by the Additionality Tool are: continuation of existing practice, operating a project without Emission Reduction support, or designing a project achieving the same result using different methods. Of these alternatives the first is the most feasible in practical terms, and it is in compliance. This project is therefore not non-additional on single compliance grounds. There is no legislation in Uganda that requires the use of efficient stoves, and none is expected to be introduced during the project period.
2. *Investment analysis.* This is replaced by barrier analysis below.
3. *Barrier analysis.*
  - Cost barrier. In the absence of the project activity, the participants will choose the cheaper alternative of continued use of current cook-stoves, with much higher emissions, simply because they are not wealthy in cash terms and would not be able to afford the higher price of either:
    - modern fossil-fuel stoves and the associated fossil-fuels.
    - charcoal stoves with increased efficiency, sold at a price reflecting the full cost of marketing without the assistance provided by carbon finance
    - alternatives such as solar cookers
  - Technology barrier. A key obstacle to the proposed activity taking place in the absence of the project is uncertainty as to the performance of the improved stove and a lack of awareness amongst potential purchasers and users, as to its benefits.

- Prevailing practice. Habitual use of traditional stoves imposes a very strong influence on the baseline scenario, resulting in continuation of use of traditional inefficient charcoal stoves.
- Barriers such as institutional, limited information, managerial resources, organizational capacity, financial resources, capacity to absorb new technologies. The widespread introduction of efficient charcoal stoves into the market requires considerable input in the form of business development capacity, financial investment, management skills, technical training, and new technology absorption capacity. All these resources are very scarce in the project region, a situation which poses a severe obstacle to scale-up of an improved stove. A 2000 DFID report notes that stove markets in Kenya and Ethiopia have grown much more rapidly due to initial attention from donors, including extensive technical and business development assistance. Uganda by contrast has not seen uptake of stoves because artisans trained to produce better stoves have received little donor support and have not been able to generate sufficient volume to achieve sustainable markets.

#### 4. *Common practice analysis.*

Experience to date with respect to development and dissemination of efficient charcoal stoves, or alternatives achieving the same or better reduction of GHG emissions, has resulted in very little change in the prevailing practice. There is evidence that the barriers listed have prevented and currently prevent widespread uptake of efficient stoves.

In 2000, a DFID report (mentioned above) identified the Ugandan improved household stove market as one of the least developed in East Africa, in marked contrast to vigorous activity in Kenya and Ethiopia. The one primary change in the situation since that time has been the investment by GTZ in an Energy Assistance Program, located within the Ministry of Energy, which has worked on developing a built-in mud stove for rural communities. The use of local materials and simple construction techniques implemented by local artisans make the stove more affordable to poor rural families. However, this approach may also make quality control more difficult, and we do not know what its impact has been on greenhouse gas emissions. This program has not to our knowledge promoted the rocket lorena stove in urban areas or offered any improved charcoal stoves. Given recent economic growth and political stability, we imagine that Uganda may become an increasingly attractive location for development programs. On the other hand, the complexities of household energy work have deterred many entities from initiating these types of activities in the past, and we don't know of any current plans for new programs.

#### 5. *Impact of carbon funding*

The carbon funding proposed here is targeted carefully, by way of building local capacity for widespread market dissemination, to remove the barriers described above. UCODEA's ability to scale-up the dissemination of high quality stoves that reliably deliver GHG reductions as well as health and well-being co-benefits is entirely dependent on receiving carbon financing. The funds will be used for the following types of activities, which are central to a well functioning enterprise. These priorities were developed by UCODEA under the guidance of Accenture Development Partners during a business development consultancy designed to help UCODEA build the foundation for expanded commercialization of stoves.

- Expand the scope and expertise of the management team, especially in financial management and marketing.
- Focus new human resource capacity on three priority business processes: order to cash; record to report; and procure to pay.

- Continue to innovate design improvements and conduct product testing.
- Enhance the physical facilities in order to improve productivity.
- Identify promising customer segments and develop marketing plans to reach these new audiences.
- Operate a customer data-base and follow-up system, based on warranty agreements, aimed at ensuring that stove performance is maintained in the years following purchase and that replacement stoves are installed as soon as repairs and servicing inputs are no longer effective.

The cost of these activities is expected to outstrip the stove revenues by a considerable amount.

## **Monitoring plan**

For this project activity it is necessary to monitor the sales of improved stoves along with their fuel savings and greenhouse gas emissions as compared to traditional stoves. It is also important to monitor the productive lifetimes and effects of aging on improved stoves and the rates of fuel-switching (particularly from wood to charcoal) that accompanies their adoption. There are four distinct monitoring activities for collecting this data; the Kitchen Performance Test, Greenhouse Gas Emissions Testing, Point of Sale Surveys, and Usage Surveys.

The Kitchen Performance Test (KPT) is a household survey administered to measure the fuel consumption of improved and traditional stoves. KPT results are used to estimate the fuel savings from different improved stoves. KPTs will be administered for all new stove models and on aging stoves to provide accurate fuel savings data during the project activity.

Greenhouse gas (GHG) emissions from new and aging improved stoves will be measured in laboratories or in the field if technologies become available. Along with KPT results, this data is used to estimate yearly carbon reductions from improved stove that are in use.

Total sales and the prevalence of fuel-switching will be monitored at the point of stove sales. Fuel-switching data is needed to track changes in fuel use from wood to charcoal, or the reverse, and informs baseline and leakage calculations.

The Usage Survey will be administered to a representative sample of households each year to account for drop-offs in the use of aging stoves. This will inform the lifetime crediting period for improved stoves.

The quality control and warranty system will ensure that a full database is kept of stove users, which will form also a basis for accurate monitoring of usage and therefore of carbon reductions. This itself will provide a solid basis for verification.