

Table 1 Characteristics of various stove models in the village of Ayamachay – Inkawasi

Model	Max Power (watts)	Energy Efficiency %	Wood consumption (kg/h)
Three-stone fire	1144,00	16,27	1,608
Non-rocket improved stove	1441,81	10,93	1,973
Inkawasi Stove	1876,70	28,19	1,367

Source: José Humberto Bernilla

The air in the kitchen is improved due to the Inkawasi's construction technology, which provides efficient combustion and evacuates the dangerous emissions via the chimney. It is mainly built from local materials such as adobe and clay; however there are

some metallic components, e.g. the chimney. (The Peruvian Andes being a prone to earth tremors, a metal chimney was preferred over an adobe one.)

### Overwhelming outcome

In 2004, an indoor air pollution and health monitoring indicated reductions of over 80% in indoor carbon monoxide and small smoke particles compared to the traditional fire. Decreases were also measured in the symptoms of respiratory illnesses among persons under 30 years of age. During the study period, the number of persons affected by cough and phlegm over a prolonged period of time fell by nearly two-thirds in the households with the Inkawasi stove. Those suffering from pneumonia were reported to have eight times less among the persons who used the new Inkawasi stove (GTZ-PAHO/WHO).

The success of the Inkawasi stove is proved as well by its high acceptance, considering the demand-driven approach: 90% of the households in

Ayamachay are now using the improved stove.

### Conclusions

Studies carried out by the Caetano Heredia University in Peruvian districts, have measured direct correlations between respiratory infections and the years of exposure to smoke from traditional fires. Usually it is the women who are affected most: particularly the older women who have been exposed to this indoor air pollution the longest suffer from respiratory illnesses such as bronchitis, cough and chronic obstructive pulmonary diseases. These findings suggest that the risk of developing a chronic bronchitis later in life is connected with the exposure to smoke from biomass burning during childhood. Infants under 5 years often are affected by acute respiratory infections that are responsible for almost 20% of all deaths in this age group.

### Reference

GTZ – PAHO/WHO: Improved cookstoves as a Key Intervention to Enhance Environmental Health in the Andes: Lima and Eschborn 2005. Report of the GTZ-PAHO/WHO project 'Improvement of Environmental Conditions (Water and Sanitation) in indigenous communities (English version: March 2006).

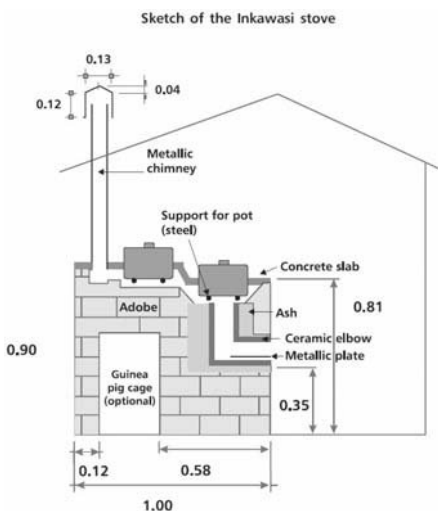


Figure 2 Inkawasi stove (measurements in metres) (image taken from publication cited in reference)

## Mass dissemination of Rocket Lorena stoves in Uganda

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A combination of strategic planning and enthusiastic beneficiaries can yield great results. In Bushenyi district in Western Uganda, over 110 000 Rocket Lorena stoves were built in just twelve months. Over 20 000 have so far been built in Rakai where the construction phase started three months ago.

### A serious problem

Firewood scarcity is a severe constraint in Western Uganda just like it is in the rest of rural Uganda. The land available is not enough for settlement, save for subsistence farming. Small plots of trees are privately owned. Wood scarcity has had big implica-

tions on the health of women. It ranges from back problems due to carrying heavy loads to risks of rape, beating, injury and snakebites.

Malnutrition is evidently on the increase as nutritious but dry-preserved foods like beans and peas are avoided because they require a lot of energy for cooking. A single meal a day is a common thing in many homes. 'We walk over 20 km in search of wood,' says Jane K., a mother of eight children. She owns one acre of land. 'I would have loved to plant trees where I could harvest firewood but it is not possible. The land is too small for trees and my subsistence.'

Women and children are exposed for up to seven hours a day to pollution concentrations above accepted safety levels.

### The solution

The Ministry of Energy and Mineral Development, with the support of the German Technical Cooperation (GTZ) through the Energy Advisory Project (EAP), has partnered with community based NGOs and the private sector to promote the improved Rocket Stoves for households and institutions. The rocket stoves for households have been modified to fit the socio-economic setting of the poor by using locally

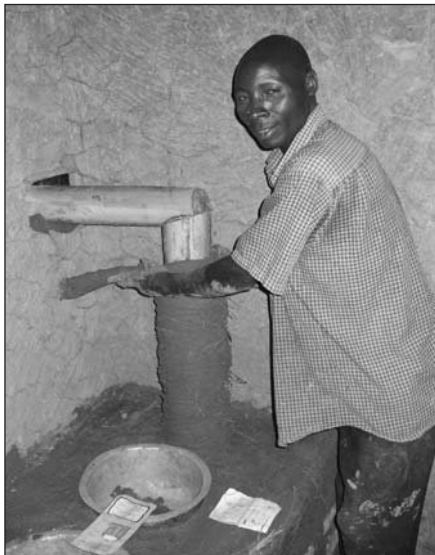


Figure 1 Locally available stove materials can be used (photo: GTZ)

available materials that can be obtained cheaply or even without a cost (Figure 1). Such materials include clay mixed with grass, ant-hill soil and sawdust.

## The technology

During a water boiling test, it was proved that the Rocket Lorena Stoves are 30% more efficient compared to the traditional open three-stone fire stove, which has an efficiency of merely 15.6%. The improved Lorena stove thus saves 50–70% of energy compared to the traditional three-stone fire. This is possible because of the shape of the combustion chamber that is specially designed to ensure correct fuel-air mixture and properly insulated to minimize heat loss, hence maximizing the temperature of the combustion chamber (See *Boiling Point* 47, page 36). These improvements result into a high combustion efficiency and an almost smokeless burning. Further, the stove design ensures that the pot sits

right inside the shielded fire chamber, hence maximizing heat transfer efficiency. The combined effect of complete burning and good heat transfer make the Rocket Lorena a highly fuel saving stove.

## The strategy

In the dissemination of the improved Rocket Lorena stoves, GTZ has followed a ‘pyramid’ strategy that starts with a few coordinators at the top and ends up with hundreds of stove builders at the village level (see Figure 2).

In this strategy, the EAP builds the capacity of an NGO in a chosen district so they can technically and administratively manage the program. The NGO appoints a number of district coordinators for the scaling up dissemination process. Since the district is divided into sub-counties, the NGO staff likewise build the capacity of selected sub-county stove coordinators. Given that a sub-county is divided into many parishes, selected potential stove builders from every village are trained at parish level by visiting trainers. Every parish is given a proven artisan to train the potential stove builders. This parish coordinator also ensures that the stove builders are organized into operational groups that can disseminate stoves. The sub-county coordinator is responsible for selection of trainees organizing the training in every parish in the sub-county. He also gives them secondary training that perfects their skills. This strategy has gone through several modifications to become what it is. Though it may not be replicated in every area, it can still be modified to suit most of the districts in the country and it is currently one of the most successful innovative schemes ever designed in Uganda.

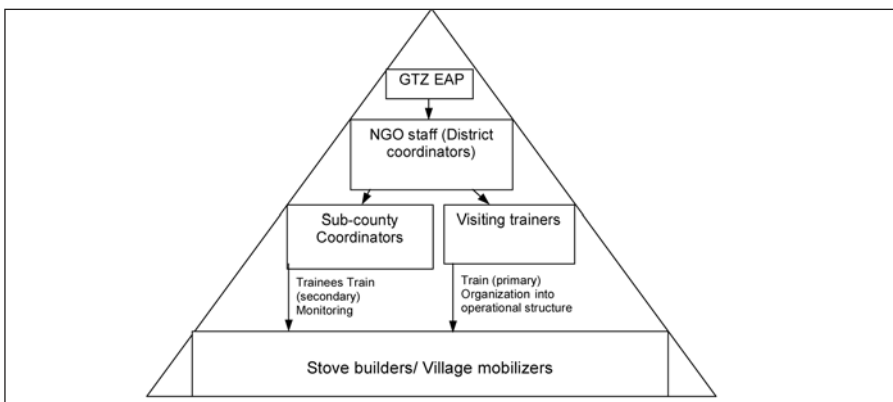


Figure 2 Pyramid strategy

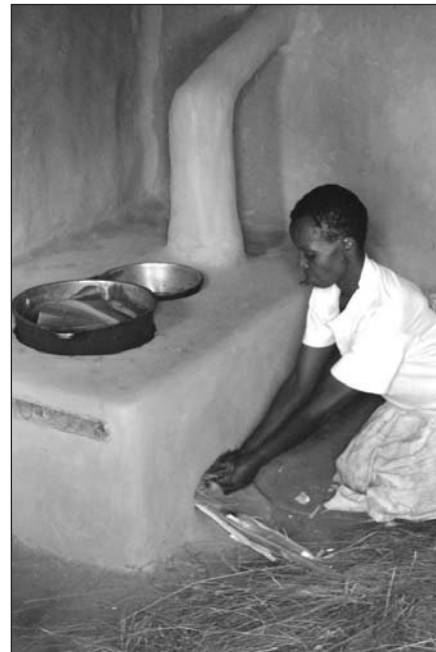


Figure 3 Satisfied cook tending her new stove (photo: GTZ)

## Sustainability

The approach could be classified as ‘semi-commercial’. One success of stove dissemination in Uganda was the integration of non-commercial incentives like, for instance, the positive image in the community. A big part of the programme was based on voluntary contributions. In the meantime stove construction has become a common ‘skill’ of many villagers comparable to the construction of houses, in other words, knowledge that can be passed on to the next generation. The large number of trained stove producers and – perhaps more important than anything else – the satisfaction of the users with the new stoves (Figure 3), assures the sustainability of the approach.

## Beneficiaries

Residents and commercial artisans have already been trained in the production and use of Rocket Lorena technologies in the wood-scarce districts of Rakai, Kanungu, Mbale, Kabale, Masindi, Kampala and Bushenyi. The low-cost design of the stoves makes them affordable even for the poorer households in these areas. During the next few months, the EAP will extend the large-scale dissemination to additional districts of the country, thus allowing an even larger share of the Ugandan population to benefit from the advantages of the Rocket Lorena stove.