SAVING
LIVES
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LIVES

E-cooking Burundi

Providing off-grid solar electric cooking to urban households in Burundi

WFP
World Food
Programme

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WFP aspires to provide innovative solutions for clean cooking through promoting electric cooking technology for urban households in Burundi. Through increasing access to these technologies, households can begin to transition away from unsustainable biomass cooking.

This will have the co-benefit of strengthening WFP's efforts to achieve zero hunger by providing beneficiaries with energy for producing, transforming and consuming food, enhancing both their food security and nutrition.

BACKGROUND

Almost a billion people around the world are without access to electricity and three billion people depend on woodfuel (firewood or charcoal) as their main energy source for cooking. Biomass combustion causes respiratory diseases leading to **close to 4 million premature deaths every year**[1], which is more than malaria and tuberculosis combined. For women and girls this is the second biggest health risk worldwide and in many developing countries it even ranks first[2,3].

Charcoal is one of the biggest traded commodities in Africa, second only to food. For many, charcoal is the easiest, if not always cheapest, source of energy for cooking, particularly in urban and peri-urban areas. As Africa's population continues to grow and more people migrate to cities and towns, the demand for woodfuel is expected to rise. More trees will be cut down to produce the wood and charcoal to satisfy the booming demand for energy, which leads to deforestation, a major driver of the climate crisis and environmental degradation.

WFP's vision for Access to Energy is for all countries to have have access to modern energy that enables high performing and sustainable food systems that contribute to achieving zero hunger by 2030

Bioenergy scarcity is increasingly becoming a challenge, particularly in areas surrounding refugee settlements due to the added pressure on shared natural resources. In many places this tends to contribute to tensions between refugees and the host populations, exposing the people that collect fuel, mostly women and children, to threats and harassment.

Women exposed to unhealthy smoke in Ruyigi camp, Burundi. Lack of access to modern energy solutions has health implications as well. Photo: WFP/ Raffaella Bellanca

This situation is **affecting nutrition and food security** as well. When fuel is expensive or hard to acquire people are forced to adopt negative coping mechanisms such as under-cooking, which decreases the food's nutritional value, bartering food for fuel, purchasing less food or less nutritious food to afford the fuel necessary to cook it or skipping meals. All of these coping strategies have a strong impact on hunger. Lack of fuel also limits the ability to boil water for drinking which exposes people, particularly children, to waterborne diseases that further limit the absorption of nutrients. Therefore, WFP's mandate on food security cannot be met without addressing cooking issues.

Charcoal cookstoves sold among household items in a market in Burundi. Photo: WFP/Raffaella Bellanca

In those cases where the international community responds to energy scarcity, it often does so by distributing basic (Tier 1 or 2) biomass stoves whose efficiency and capacity to decrease emissions are not adequate to prevent deforestation or limit the incidence of respiratory diseases. There is also a considerable problem to achieve the desired uptake for these stoves. Given that biomass stoves still need firewood or charcoal to function, this only partially solves the fuel sourcing problem.

Burundi, a small country in East Africa, is no exception to the struggles that developing countries face when it comes to energy for cooking. **Firewood covers about 94% of primary energy consumption in Burundi** and population growth in combination with land use pressure and rising demand for natural resources has led to worrying levels of deforestation. An estimated 71.7% of the population lives below the poverty line of US$ 1.90 per day (World Bank, 2013), so economic means for clean cooking are very limited. In Burundi's biggest city, Bujumbura, charcoal is the main source of energy for cooking across all social layers of the population. With a cost that is higher than that of LPG, the use of charcoal is a significant share of household income.

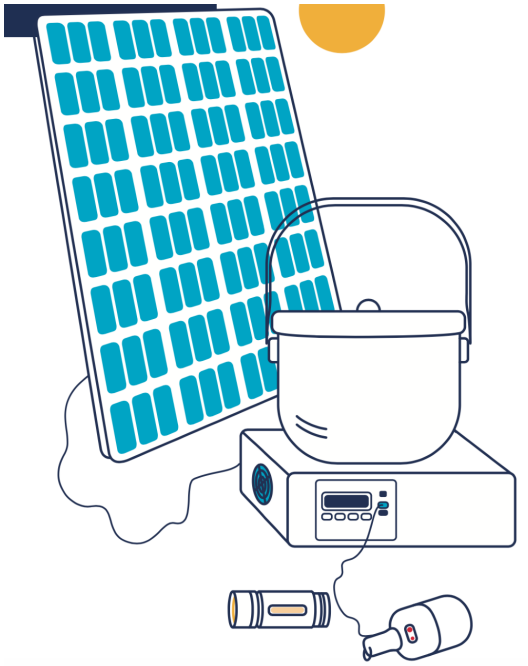
CLEAN COOKING WITH THE SUN

One solution to cooking with biomass, or systems that require expensive fuel, is to shift to a clean, efficient, sustainable and environmentally friendly cooking system that uses **solar power as an energy source.** Solar-PV panels can capture energy from the sun to be stored in a battery, which in turn can power an electric cooking appliance. A shift to solar e-cooking means that end-users no longer pay for cooking fuel, indoor air pollution exposure is removed and pressure on forests is reduced. A tremendous reduction in the prices of solar-PV panels, combined with innovations in efficient, insulated, electric cooking appliances have spurred the interest in 'solar e-cooking' in recent times. These e-cooking solutions can benefit off-grid communities through standalone solar systems or mini-grids. Unreliable 'weak-grid' connected households, that face frequent power outages, can also be targeted with this solution. Households with access to a stable grid, might instead opt for a grid connected e-cooking solution which does not require a solar panel and battery.

Pesitho (www.pesitho.com), a Danish social enterprise that was established in 2017, developed the **ECOCA**, a compact, self-contained, multi-purpose home cooking unit consisting of an electric base hosting a lithium battery pack and regulation system, a 275W solar panel, two chargeable light bulbs and two highly insulated pots. The unit is small, light-weight, and simple to use. The electric base powers the pot through a small circular connector, which fits into the bottom of the pot (similar to an electric kettle). Together with insulation, this considerably increases the energy efficiency compared to an electric flat plate. The presence of a solar panel enables pay-as-you-go (PAYGO) payment systems and remote access to usage data.

The ECOCA in Burundi has contextualized settings that enable end users to meet several cooking needs, ranging from reheating food, to boiling dishes such as rice, potatoes and beans.
Aside from cooking, the ECOCA can be used to charge light bulbs, phones and small appliances, a feature appreciated in Bujumbura which is affected by frequent black outs.

Picture of the ECOCA e-cooker, showing the base and the 5 litre pot which has a 400W heating element inside it. Photo: Pesitho



Schematic visualization of Pesitho's ECOCA. The image shows the solar panel, the unit that includes the batteries, the pot, the light bulb, two USB-charging ports and the power buttons. Photo: Pesitho

WFP'S INTERVENTION

Through its **Innovation Accelerator**, WFP has supported a pilot project to promote the ECOCA to urban end-users. The primary identified market segment for this project were WFP Burundi staff in the three main cities (Bujumbura, Ngozi and Gitega).

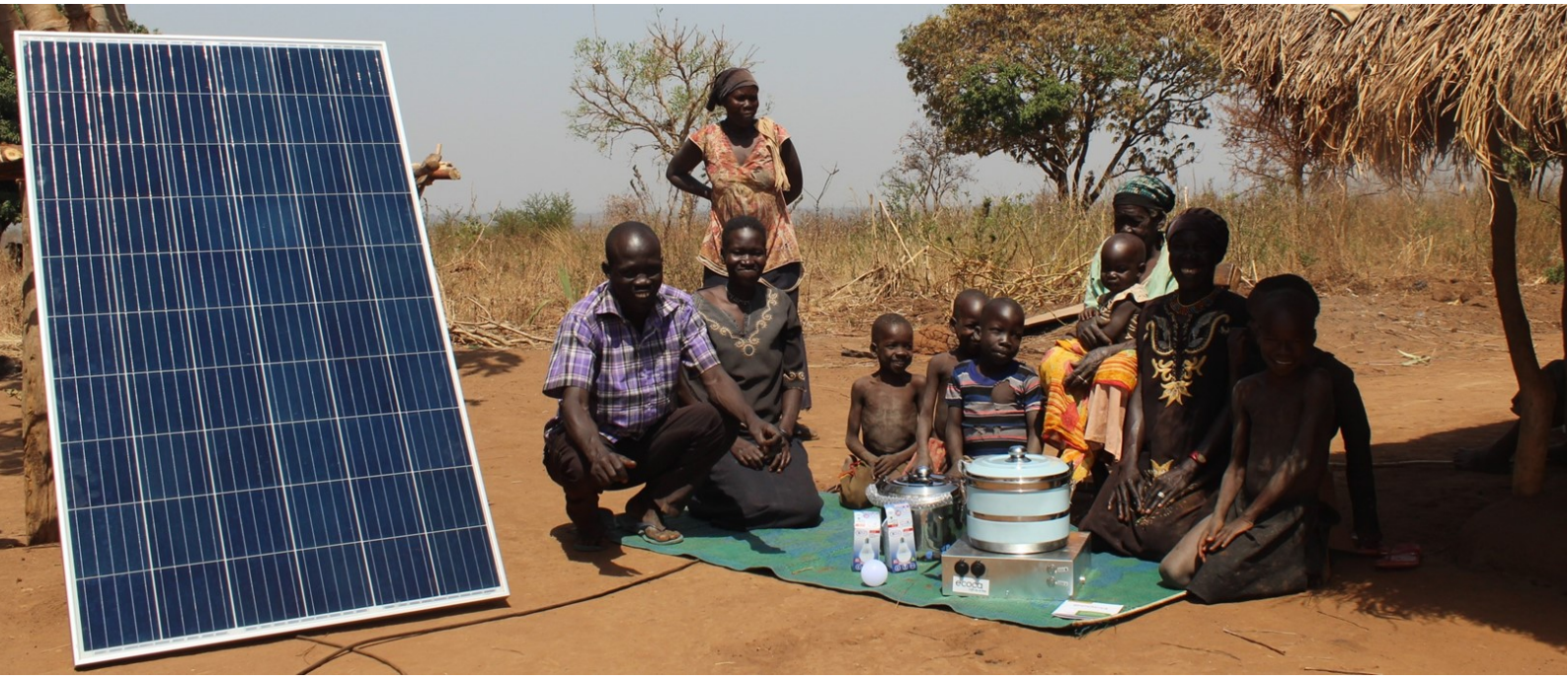
This intervention started in 2019 and was intended to ascertain urban end-users willingness to pay, based on the assumption that economic gain in the medium to long term and health benefits would be an attractive value proposition for them.

Fifty devices have been offered at a subsidized price of 200 USD, half of their estimated cost of 400 USD, to WFP's employees.

During the initial phase 7 ECOCA were distributed to volunteering families as a trial. A team of two trainers have been supporting the families in their adoption of the new technology with regular visits and call line for troubleshooting. A WhatsApp group has also been set up for users to exchange experiences among themselves but also to communicate directly with Pesitho and their local technicians.

The ECOCA has undergone slight design changes due to the need to adapt the product to local needs and habits. Minor repairs and hardware substitution were necessary in some cases and successfully carried out by Pesitho's local technicians. It has also emerged that several families required more than two pots to satisfy their cooking habits and needs.

Following this phase, WFP employees have been asked to confirm their interest to buy the appliance through either paying upfront or instalments deducted from their salary by WFP. The upfront capital investment to obtain the ECOCA might be much higher than the cost of buying a traditional stove, however, when analysing cooking expenditure over a number of years and factoring in the monthly amount spent on charcoal for cooking, the ECOCA actually becomes more



A household using the ECOCA for cooking. Photo: Pesitho

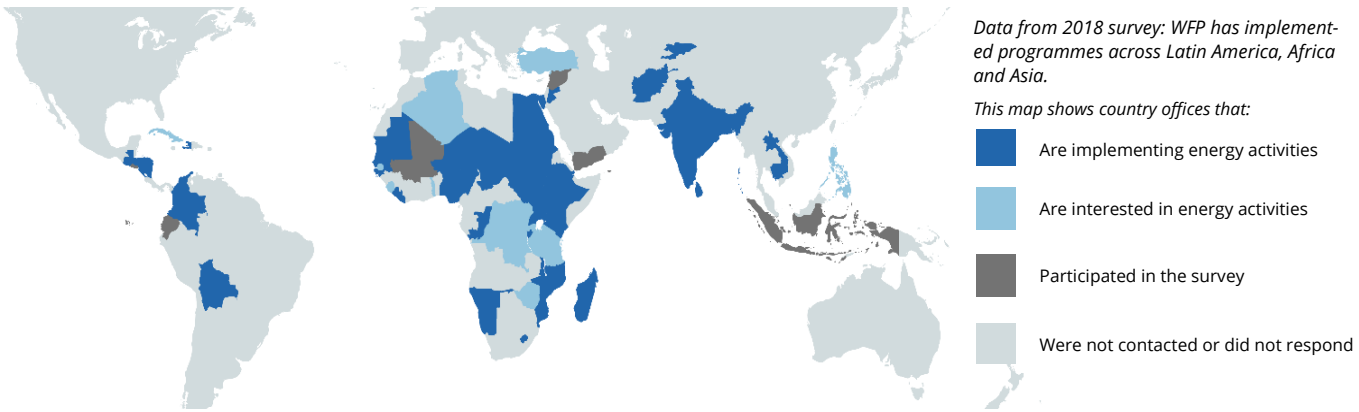
affordable. To make the ECOCA affordable for households with low monthly spending capacity, a pay-as-you-go model will be developed, which will allow end-users to pay for the unit in instalments.

So far, the outcomes of the project have been promising with many households showing interest in buying the ECOCA.

FUTURE PLANS

- **Price reduction.** It is envisaged that economies of scale will contribute to decreasing the price of e-cookers. Another factor is the continuous technology advancements and decreasing global price trends for PV solar and energy storage. In stable on-grid situations, the expensive PV panel and battery would not be necessary making the solution much more affordable.
- **Carbon credit scheme.** Significant reduction in CO2 emissions from cooking from a shift from biomass to e-cooking can be monetized by a carbon credit scheme. The profits could be used to subsidize the price of the unit for those households at the bottom of the pyramid.
- **Model upgrades.** Pesitho is aiming at introducing pressure pots, cutting cooking times and reducing energy consumption, and further strengthening the economic case and end-users' acceptance and adoption of the e-cooker.
- **Institutional e-cookstoves.** WFP school feeding programmes support 76,000 schools globally, reaching 16 million children. Clean cooking is a real issue for many of those schools, which are looking for better options to biomass based cooking. WFP is looking at ways of introducing institutional solar e-cooking in its programmes.
- By promoting e-cookers among employees, **WFP can also reduce its own indirect carbon footprint**. The potential to scale up in other countries and with other organizations is substantial.

1. https://www.who.int/en/news-room/fact-sheets/detail/household-air-pollution-and-health
2. https://www.who.int/features/factfiles/malaria/en/
3. http://apps.who.int/gho/data/view.main.57020ALL



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