

New markets for electric cooking devices in Africa and SE Asia

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1 Summary

The MECS programme is leading a shift across much of the developing world from cooking with biomass to cooking with electricity or gas. Partners include World Bank, UN, WHO and national governments along with major financial institutions. This is unlocking new business models and subsidies that will make electric cooking devices affordable in these countries.

Did you know that:

- 3 billion people cook with biomass and 4 million people die each year from the household air pollution it creates?
- Nearly 2 billion have electricity but do not cook with it.
- In SSA alone \$34 billion is spent on charcoal or other polluting fuels and in many cases cooking with electricity would actually save households money!

We are already speaking to a pan-African association that is looking to procure 50,000 cooking devices and a major national utility with 6.5m customers that is in the process of securing finance to make cooking devices available to its clients.

The MECS programme provides a wealth of support to help make electric cooking devices available across the developing world. In particular, we are shortly launching a Global LEAP Award for Electric Pressure Cookers. Products that secure this award will become the preferred devices for our partners and others and will be promoted globally.



2 What is driving a global effort to enable people to cook with electricity?

Cooking with wood or charcoal (biomass) as fuel is hugely damaging to health and the environment. Household air pollution from cooking with traditional solid fuels contributes to nearly four million deaths every year. Up to 34% of biomass fuel harvested contributes to local forest degradation. Burning biomass results in significant carbon emissions - a gigaton of CO₂ per year.

The three billion families that cook with biomass in the developing world can be roughly divided into:

- two billion that have access to electricity but don't cook with it. These are generally in urban areas, where electricity comes from a grid and most pay for their biomass fuel.
- the one billion that do not have access to effective electricity. These are in more dispersed rural areas and spend time collecting firewood.

This results in two situations, both of which create an opportunity for electric cooking.

In many countries, **the generation of grid electricity is now exceeding demand**. For instance, in terms of electricity generation capacity, several East African countries are currently on course to substantially increase their installed capacity. This is driven by long-term economic growth ambitions and provides an opportunity to expand electrical demand. Recent installations in Uganda have increased generating capacity to 950 MW, creating a generating surplus, for the moment. Power Africa has identified a further 1900 MW of projects for completion by 2030. The World Bank estimate that not only will generating capacity in Kenya double from 2,300 MW in 2015 to 5000 MW in 2020, but the share of renewables will also increase from 65% to 84%. Generating capacity in Tanzania was roughly 1500 MW in 2017, and with a further 1600 MW planned, this capacity is projected to double imminently.

Alongside this, there are substantial programmes across the developing world to roll out electricity access to rural areas with the aim of meeting the Sustainable Development Goal of "Access to affordable, reliable, sustainable and modern energy for all by 2030". Those working on delivering energy through mini-grids are faced by **the difficulty of securing a load expectation that demonstrates a clear return on investment** to potential investors which warrants the up-front capital required.

As a result of this, there is a growing interest in driving a transformation of cooking practice away from using biomass as fuel to using electricity or gas. This is of great interest to development agencies and national governments because of its potential to:

- Universally reduce the harm and costs that result from cooking with biomass
- In urban areas, **create additional demand for electricity** where there has already been investment which provides opportunities for increased revenue generation.
- In rural areas, **increase the viability and revenue potential from electricity provision** by adding a valuable "anchor load" for electrification programmes.

Not only is there an interest in this, but it is becoming increasingly feasible. Advances in solar photovoltaics, new battery technologies and innovative 'pay as you go' business models are opening up new opportunities for transitioning the way people cook. This research and innovation commissioned by the UK Department for International Development (DFID) has looked at the potential for solar panels combined with battery, heating appliance; control panels as a clean, modern energy option for poor households. The promising research, known as 'eCook', signalled that cooking from renewables was technically viable and adaptable to standalone and mini-grid situations.

Preliminary economic modelling found that by 2020 the **monthly discounted cost of an eCook system could be of the same order as household expenditure on purchased charcoal**. Charcoal has considerable challenges in its supply chain, leading to increasing prices, and policies in a number of African countries seek to regulate and limit charcoal production.

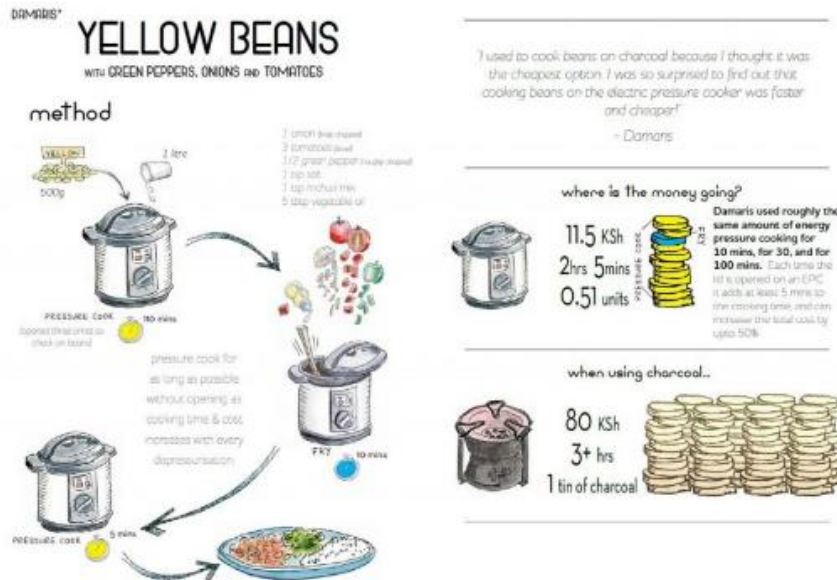


Figure 1: Extract from eCookbook produced by MECS programme showing a recipe and the savings that can be achieved.

Cooking with electricity could present a disruptive and transformative value proposition for households, allowing for more efficient and faster cooking times, adjustable heat levels, safer cooking and absence of dangerous indoor emissions, as well as a visibly cleaner cooking environment.

3 The Modern Energy Cooking Services Programme

The MECS programme is leading this change with £40m from the UK Government combining research into the requirements for cooking, modelling solutions, providing challenge funds and working with partners that can put in place finance to support scale up. Our partners include the UN, World Bank, WHO, Clean Cooking Alliance and many national Governments.

In the first instance, the focus will be on urban areas where there is access to increasingly reliable electricity with most having an AC supply while 1.4 billion pay for biomass fuel.

Our Challenge Fund is already supporting projects supporting innovation the business models and cooking device designs that will mean there are suitable devices available at an affordable basis in target countries. Winning organisations and projects from our first round include:

- BURN – developing an EPCs that has a lower price point for the Kenyan market as well as a PAYC option with more advanced features.
- EarthSpark International - an early stage feasibility study of microgrid connected electric cooking technology in rural Haiti.
- Fosera – developing off-grid DC powered efficient cooking appliances for Myanmar & Kenya
- M-Kopa – reviewing a Pay As You Cook model to make electronic cooking assets affordable
- SCODE – developing and evaluating DC electric pressure cooker units in Kenya

- SunCulture – developer of the ClimateSmart™ Solar Energy System for irrigation that allows the use of solar cookers

There are proven business models for making high tech devices available across Africa through innovative approaches. According to BBOX, customers in Kenya and Rwanda usually earn US\$100-\$200 per month and spend \$8-12 on energy expenditure such as purchasing kerosene, batteries, and charging their phones. BBOX' business model enables the cost of a solar system to be paid over time, enabling the masses to purchase clean renewable solar energy. Since 2010, they have sold over 150,000 units across 35 countries. Similarly, M-KOPA pay-as-you-go solar systems are used by three million people in 750,000 homes and businesses in East Africa.

We are also working in-country with key partners. As a result of our discussions, a major pan-African energy access network is looking to procure 50,000 cooking devices to distribute and a national utility country with 6.5m customers is sourcing finance to enable it to make available electric pressure cookers to its customers on a pay as you go basis. We can provide introductions to these and other distributors and large volume customers.

It will be critical to ensure that the devices people available for households to use are safe and suitable for their cooking conditions. We are funding a Global LEAP Award for Electric Pressure Cookers. This will establish a small number of cooking device companies as the preferred suppliers for major bulk purchasers across the developing world. The Award process is currently in development with the standards and specifications being refined prior to announcing the call for entries. See separate briefing note about this. If you want to be kept informed of when this is announced, you can sign up for our newsletter at our website.

A key part of our work is to carry out cooking diary studies to develop a deep understanding of the cooking requirements of different countries.

The MECS project has undertaken real world trials in Kenya, Tanzania, Zambia and Myanmar to determine the energy consumption of meals cooked using electricity. Combined with stakeholder discussions, focus groups, and discrete choice modelling experiments, the data collected by 'cooking diaries' has given evidence of the potential energy, time and money savings associated with a range of electrical cooking equipment. While hotplates can cook 'tasty' meals with significantly less 'fuel' cost than charcoal (in urban centres), the savings are much greater with multicookers. This initial research has shown that these multicookers (or electric pressure cookers) can undertake more than 80% of the meal recipes that people prefer within the countries of study, including the main staples.



Figure 2: Cooking trial, monitoring energy consumption of eCooking.

We are working with partners for these to be replicated elsewhere. This will enable us to build a clear picture of the different considerations that will make cooking devices acceptable and fit with the local culture and context.

Based on these we are creating eCookbooks that are written by local cooks, containing recipes and explaining the many benefits of using suitable devices.

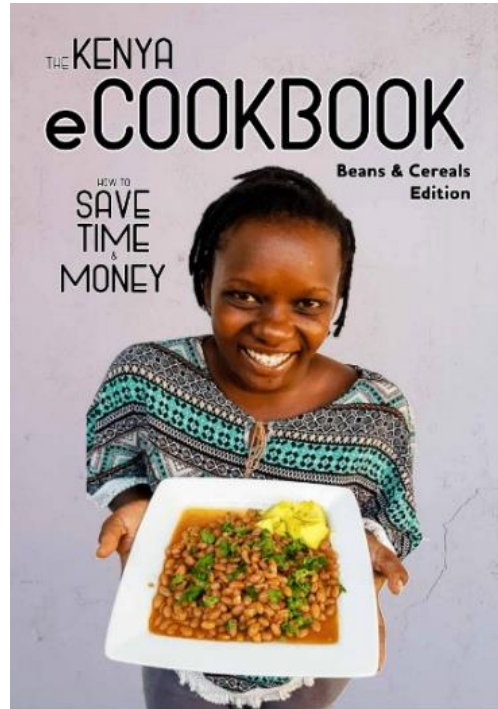


Figure 3: the eCookBook for Kenya

We are publishing briefings on our research to help companies understand the opportunities and find their routes into these markets. They are available on our website at: <https://mecs.org.uk/download-category/device-briefings/>

If you would like to know more about the MECS programme and discuss how we can work with you, contact Dr Nick Rousseau on n.rousseau@lboro.ac.uk.