Introduction

Electric cooking appliances, such as electric pressure cookers (EPCs), have the potential to generate positive impacts on public health, the environment, and women's empowerment while also being an important driver of energy demand that can improve the financial sustainability of rural electrification. This fact sheet focuses on electric cooking adoption in Tanzania.

Key Facts of the Application Environment

In Tanzania, the majority of households cook with biomass, with 27% of households using charcoal and 66% using another solid biomass.[1]

Adoption of improved cookstoves stood at a rate of 5% in 2012,[2] meaning the majority of biomass fuels were used in three-stone fires or traditional cookstoves, which are heavily polluting.

Approximately 40% of households, comprising of 73% urban households and 22% rural households, have electricity access as of 2020.[3] Despite the growing rate of electricity access, less than 1% of households cook with electricity. Tanzania has no official regulation promoting electric cooking but households are incentivised to increase electricity consumption through a lifeline tariff: households consuming less than 75kWh of energy per month are charged a tariff of 100 TZS ($0.043) per kWh, which is a reduction of 350 TZS ($0.13) per kWh.[4] Electric pressure cookers and induction stoves are among the most energy-efficient electric cooking appliances, which improves their suitability in off-grid and low-income contexts.

Technology	Electric pressure cookers (EPCs) and electric cooking in general.
Application	Electric cooking appliances, such as EPCs, can be used to cook local cuisines while saving users time and money.
Technology Overview	Electric pressure cookers use electricity to heat and pressurise a cooking vessel, which minimises heat losses and cooking times. They typically use AC power, but battery-assisted and DC models are beginning to enter the market. Stove-use monitoring (SUM) technologies can be used to gather data on electric cooking appliance usage.
Economic and Financial Feasibility	Cooking with an EPC is often cheaper than cooking with charcoal.
Benefits and Outcomes	Electric cooking reduces negative environmental and health impacts as well as gender inequality, which globally costs $2.4 trillion per year. Users of EPCs experience many benefits and rank at the highest tiers of access to clean cooking in the World Bank's Multi-Tier Framework.
Constraints and Risks	Cost is a potential barrier for users who may need to own multiple appliances before fully switching to electric cooking. In general, there is a lack of awareness among consumers and policy makers about the benefits of electric cooking.
Future Perspectives	Additional opportunities for e-cooking will be unlocked as electrification progresses.

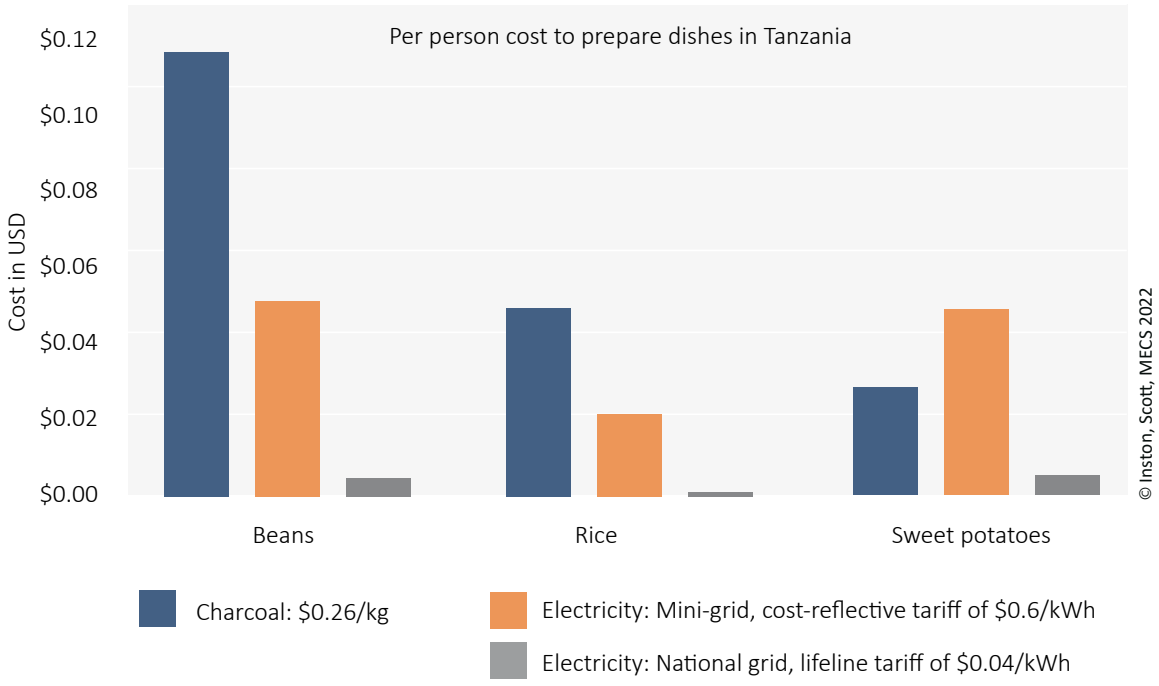
40%

of households in Tanzania have access to electricity

Economic and Financial Feasibility

The cost of cooking with electricity is context specific and varies depending on the dish cooked, the appliance used, and the tariff applied. Generally, households connected to the national grid that cook with charcoal are seen as more likely to adopt electric cooking appliances because of the potential savings. One study in Tanzania found that cooking with an EPC under the national grid tariff would be cheaper than cooking with charcoal for almost all participating households.[6] With mini-grids and cost-reflective tariffs, electric cooking can be cost competitive with charcoal.

The introduction of EPCs into households can also improve the financial sustainability of utilities, especially around rural electrification and mini-grids. One study in Tanzania found that EPCs increased overall household energy consumption between 20%–200% depending on the tariff charged.[7] As electric cooking demand is elastic, the introduction of EPCs and other electric cooking appliances into households can provide financial incentives for utilities to decrease tariffs.



Graph 1: A study in Tanzania found that cooking with electricity was cost competitive when a cost-reflective, mini-grid tariff is applied and cheaper when on the national grid compared to charcoal. From "Costs of cooking with different fuels a case study from mini-grids in Tanzania" by Inston, R. & Scott, N., 2022, MECS.[6]

Benefits and Outcomes

By cooking with electricity, households save time, decrease cooking costs, and reduce their exposure to indoor air pollution. Cooking with electricity reduces time spent collecting fuels—a task that is primarily done by women and children, which requires an average of 1.4 hours per day in Tanzania. Efficient appliances, such as EPCs, often reduce cooking times by 50% and can reduce the cost of cooking large meals by as much as 90%. Electric cooking also eliminates indoor air pollution caused by biomass cooking, which has resulted in more than 500,000 premature deaths every year in sub-Saharan Africa. Globally, the cost of inaction for not achieving access to clean cooking amounts to $2.4 trillion per year.[8]

The impact of electric cookstoves can be assessed under the World Bank's Multi-Tiered Framework (MTF) for cooking, which evaluates access to modern energy cooking services (MECS) across six attributes: exposure to pollutants, efficiency, convenience, safety, affordability, and fuel availability, using a six-tier ranking (Tier 0 to Tier 5). The Clean Cooking Alliance and ISO have also developed a similar framework of voluntary performance targets for stoves. This includes metrics for thermal efficiency, carbon monoxide and PM emissions, safety, and durability. Households that cook with electricity and have access to a reliable grid that charges reasonable tariffs would achieve the highest level of rankings across all attributes included in the two frameworks.

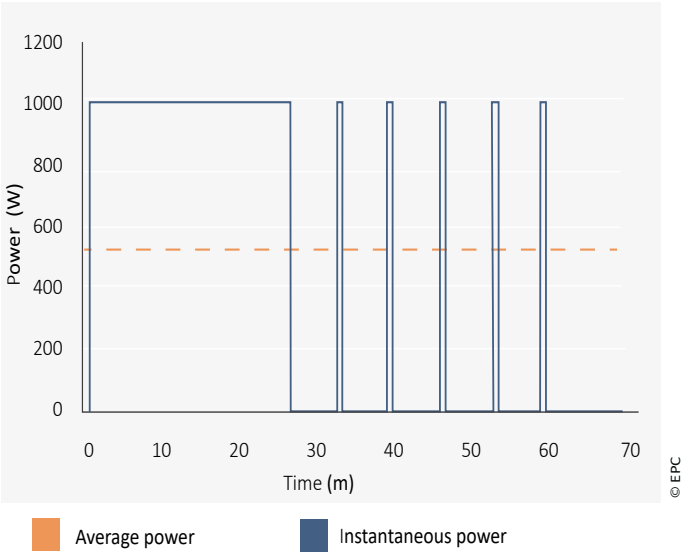
Technical Information

There are many electric cooking appliances, such as electric hot plates, water kettles, rice cookers, and microwaves.

Induction stoves use copper coils and magnetic fields to induce electrical currents in cooking vessels, such that the pot or pan emanates heat rather than the stove itself. Induction cooking requires users to have cookware that has ferromagnetic metal, such as cast-iron skillets. For this reason, it is less popular in East Africa than electric pressure cookers, which require no additional cookware.

Electric pressure cookers cook food by raising the temperature of a sealed cooking chamber, thereby increasing the pressure within the chamber and cooking food quickly and efficiently. When fully pressurised, EPCs use more energy to heat up than they do to stay hot. This results in a characteristic energy consumption pattern where there is an initial period of full power that is followed by a period of the power cycling on and off. As such, an EPC will typically have an average power that is less than its rated power.

Image 1: The SESCOM EPC is a Global LEAP Award Winner and one of the most prevalent EPCs available in Tanzania.



Graph 1: After an initial heating phase, the EPC power cycles on and off, which lowers the average power below the peak power and helps to conserve energy.

The majority of EPCs and other electric cooking appliances are AC powered and require more power than a typical solar home system can provide. Battery-assisted and DC-powered EPCs have only recently entered the market.

Some EPCs and electric cooking devices include stove-use monitoring (SUM) technologies, which gather data on appliance usage and have the potential to unlock carbon financing for users and distributors. However, integrated SUM technology is not yet common in appliances found in the local market. Many studies on electric cooking in Tanzania have used external stove-use monitoring devices such as smart meters to gather data.

There are currently no governmental quality-control regulations for electric cooking appliances in Tanzania. In 2020, the Efficiency for Access Coalition started the Global LEAP Award programme for EPCs to test products, identify high-quality models, and provide specifications as well as performance metrics for public use.[5] The Global LEAP Awards have been used as a benchmark for quality control in other programmes, such as the Modern Cooking Facility for Africa.

Constraints and Risks

Households tend to stack cooking fuels in order to cook multiple dishes simultaneously, so there is often a need to have multiple appliances in order to achieve full access to MECS. The cost of efficient electric cooking appliances such as EPCs (typically $75 –$100) is a potential barrier to adoption that can be mitigated with asset financing, carbon finance, and supplier incentives.

In markets like Tanzania, consumers often lack awareness about or have a negative perception of electric cooking. To scale electric cooking, consumers need to learn about its benefits: appliances like EPCs can save time and money, and can be used to cook local cuisines. Similarly, policy makers, energy stakeholders, and other groups also need to understand electric cooking is a viable solution for achieving numerous development goals. Currently in Tanzania, there are limited policy references to electric cooking and most clean cooking policies focus on biomass.[9]

Poor energy infrastructure has the potential to disrupt the electric cooking market. Unreliable grids can frustrate users when stoves stop working during power outages and unstable voltages can damage or break appliances. On both mini-grids and national grids, there are concerns that large-scale adoption of electric cooking appliances will induce power outages resulting from large numbers of users cooking simultaneously. Data collected through SUM technologies can help utilities assess their infrastructure and implement initiatives such as time-of-day tariffs to accommodate demand

Future Perspectives

The cross-cutting nature of electric cooking means that many stakeholder groups have interest in promoting electric cooking, but few have a mandate to do so. Countries should consider policy frameworks that coordinate the activities of the energy, health, environmental, and private sectors.

Utilities should include electric cooking in their energy strategies and planning, as the demand for energy from EPCs and other cooking appliances could either be a significant source of revenue or a strain on infrastructure.

Data collection and monitoring of stoves will play an important role in the development of the electric cooking sector. Integrated SUM technologies will unlock new business models, such as pay-as-you-cook stoves, and new revenue streams, such as carbon finance from Gold Standard, which requires stove monitoring for stoves where a usage rate of over 90% is reported.

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