GHANA ecookbook exploring electric cooking

RECIPES FOR BEANS W/ PLANTAIN TUOZAFI W/ AYOYO BANKU W/ OKRO JOLLOF RICE KONTOMIRE KELEWELE

AKAI

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www.eCookbook.org

www.mecs.org.uk

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INTRODUCTION

This edition of the Ghana eCookbook is a publication by the Modern Energy Cooking Services Programme and forms part of its series of eCookbooks. This eCookbook aims to shed light on three particular research questions:

1) can popular Ghanaian foods be cooked using modern energyefficient devices

2) On a dish by dish basis, how much electricity does it consume and how does it compare to primary cooking fuels in urban Ghana (charcoal and LPG)?

3) Is it convenient to use electricity for cooking and how does the taste compare?

Currently, only 1% of Ghanaians use electricity as their primary cooking fuel. Few people have an idea of how much it costs to cook typical Ghanaian foods. Our preliminary findings indicate that it can be 2 to 3 times cheaper to cook using electricity than LPG or charcoal. By exploring the relationship between energy use and cooking we hope this book can inform cooks on how best to take advantage of the opportunity to cook using electricity in Ghana. All the more since Ghana has a high rate of connectivity (87 percent), has entered a period of surplus capacity and has relatively stable provision of electricity in recent years.

In order to determine preliminary time, energy and cost implications of cooking using electricity in Ghana we conducted multiple controlled cooking tests. Abigail Sarpong, Jacob Fodio Todd and Steyn Hoogakker with his team of research assistants and participants in Accra documented and tested Ghanaian recipes for electric pressure cookers and airfryers, as well as on LPG and charcoal stoves, with energy measurements taken using the MECS controlled cooking test protocol (CCT).



// firstly, it is feasible to cook the majority of Ghanaian traditional dishes using electricity, and EPCs specifically, and secondly, it can be many times cheaper! //

OVERVIEW

Our focus is on dishes typically prepared in homes across Ghana. We determined this by using MECS' culinary typology survey, an approach which provides a broad-brush stroke of common dishes, and their preparation without capturing all the nuance of how people cook.

The dishes featured represent a range of cooking processes commonly used in the country, such as boiling, simmering and (shallow) frying, in order to draw attention to the wide compatibility of modern energy-efficient cooking devices with the rich Ghanaian cuisine.

In this eCookbook we feature; vibrant jollof rice; warming black-eye beans and ripe plantain; comforting banku and okra stew, richly flavoured tuozafi, nourishing kontomire and moreish kelewele. The eRecipes are all prepared with electric pressure cookers or with an airfryer for the latter. We provide energy, cost and time measurements and also where possible comparisons with other common cooking fuels, such as charcoal and LPG.

We hope this eCookbook can provide some insight into the possibilities of cooking with electricity. More than 87 percent of Ghanaians have access to electricity, yet more than 70 percent are still using biomass fuels for their cooking, Here, we demonstrate that firstly, it is feasible to cook the majority of Ghanaian traditional dishes using electricity, and EPCs specifically, and secondly, it can be more convenient and many times cheaper!



COMMON COOKING FUELS IN GHANA

FIREWOOD

The most popular cooking fuel in rural Ghana, firewood, can be obtained at low or no cost in many rural areas, vet the burden rests largely on women and children. Despite an obvious financial incentive, it is time-consuming and hard work gathering firewood, and as a low density fuel, requires collection of significant quantities. In addition, pressure on forest and a growing population resources suggest lower availability and higher cost implications going forward. It is also a highly polluting cooking fuel contributing to many respiratory illnesses (est. annual premature deaths of 20.000 in Ghana), is difficult to use in bad weather and by producing large open flames, poses a high accident risk for households. Firewood in urban areas is mostly used by small- and medium enterprises cooking in bulk (e.g. kenkey).

Typical cost: free when gathered - variable rate in Accra | July 2023

CHARCOAL

In many urban areas, charcoal dominates as a cooking fuel, because it can be purchased in small quantities and is readily available in residential, nonresidential areas and markets. It burns at a higher temperature for longer and more consistently than firewood and produces less smoke, although it gives off more carbon monoxide, which can be deadly in poorly ventilated spaces. Charcoal stoves are also popular due to their portability, durability and compactness. Manv improved cookstoves (ICS) like the popular Gvapa stove. have some improved efficiency compared to coal pots however, the coal pot is still widely used. Charcoal varies in quality, takes a long time to light, and is difficult to use in wet conditions. It is also a highly polluting fuel that contributes to health complications with frequent use.

Typical cost: 1kg = 3.10 GHS - avg purchases in Accra | July 2023



CLEAN COOKING FUELS IN GHANA

LPG

Starting in the late 1980s, the government encouraged a shift to cleaner cooking fuels, with the introduction of Liquefied Petroleum Gas (LPG). LPG has penetrated urban markets though rural areas and urban low-income areas have relatively low uptake. For cooks, gas stoves light instantly, offer fine control of heat has a high energy density compared to conventional when biomass. so compressed into cylinders, can be convenient to use. However, refills transportation or replacements can be extra costly and time-consuming, and there are sometimes shortages. Although Ghana produces some LPG, most is currently imported. There are also steep cost fluctuations and since the removal of the LPG subsidy programme, price increases. The stoves and appliances are also more costly than biomass equivalents and the lack of standards and durability of cylinders and valves, and the risk of leakages, lead to safety concerns. Hence the recently introduced cylinder recirculation programme.

Avg cost in Accra 6 months: 1 kg = 12.67 GHS | 1 Jan - 1 July 2023

ELECTRICITY

Few households use electricity for cooking, despite the huge strides in increasing electricity generation and access in Ghana recently. Many are now grid connected, so Ghanaians now have another largely unexplored cooking fuel option available. Blackouts and brownouts have traditionally been an issue, however ensuring grid stability is a government concern, with expectations of increased reliability in the future. New electric cooking appliances enter the market all the time, and while upfront costs of these appliances can be high, the perception of electricity being expensive to use for cooking is challenged in this eCookbook. We present evidence both of the compatibility of these appliances with popular Ghanaian dishes and how it can be significantly cheaper and faster. Many electric appliances also offer high convenience, efficiency, automation, and numerous safety features. It is also, of common cooking fuels, considered the cleanest even more so with Ghana's ambition to add more renewable energy to the grid!

Residential tariff : 1 unit kWh (0 - 300 kWh) = 1.37 GHS | July 2023



ELECTRIC COOKING APPLIANCES

Many electric cooking devices are marketed for specific tasks, (e.g. rice cookers) but are far more versatile appliances, with many useful functions. New products are always coming to market, opening up new opportunities for cooking with electricity.

ELECTRIC PRESSURE COOKER (EPC)

The electric pressure cooker (EPC) is a combination of familiar things (an electric hotplate, a pressure cooker and a insulated hotbox) with a fully automated control system. It is a highly energy efficient appliance, able to cook foods faster by raising the temperature at which food cooks. For foods that take a long time to cook and don't need stirring or checking often, such as beans or tough meat, there are significant gains. Being automated, it is also highly convenient.

AIRFRYER

Airfryers are one of the fastest ways to cook certain foods, e.g. those that might be usually baked or fried, such as plantain, yam or tilapia. Airfryers use a heating element and a powerful fan in a compact casing to circulate hot air, much in the same way a convection oven might. Because of the fan, aerated basket and compact size of most airfryers, less oil is needed to create a crisp finish, as well as fast cooking times. However, they are expensive and due to their small size also restrictive if wanting to cook large quantities or families or wanting to cook multiple dishes simultaneously.

KETTLE

Many efficient electric cooking devices are optimised for specific cooking purposes. The kettle, used almost uniquely for warming and boiling water, is a case in point. Although it isn't as versatile a cooking device as many other appliances featured here, it can facilitate other cooking process by preheating water, can be used to boil eggs, or simply be used to make tea, or coffee. They are also relatively cheap and readily available.





ELECTRIC COOKING APPLIANCES

HOTPLATE

The electric hotplate is one of the simplest electric cooking devices, and one of the cheapest. Electric current passes through a heating coil underneath a plate or spiral and heats it up. It can be used to prepare almost all the dishes in Ghana and does not require special cookware, although the heat can be difficult to control accurately.

RICE COOKER

Rice cookers have been embraced because they cook and keep rice warm effortlessly, without risk of burning it, with their inbuilt thermostats and good insulation. They are increasingly popular in Ghana, especially among students staying away from home. It is an efficient way of cooking simple rice dishes, but they can also be used to cook stews & soups, with simple manipulation.



MICROWAVE

Microwaves are best known for their ability to warm and defrost food. In addition, it can be used to cook certain foods, in an energy efficient manner, although it is limited in the way it cooks. They can also be costly to purchase.

INDUCTION HOBS & COOKWARE

Induction stoves use electro-magnetic heat transfer to directly heat certain cooking pot materials. They are versatile cooking devices with the ability to precisely control heat during the cooking process and are more efficient than hotplates, although they favour flat-bottomed pans. They also have safety features that protect against burns or shocks.



COOKING IN GHANA

With a culinary culture as rich and diverse as Ghana, our preliminary research for this eCookbook focused on a few classic dishes that represent a range of cooking processes commonly used in the country, such as boiling, simmering and frying in order to explore the compatibility of modern energy-efficient cooking devices with Ghanaian cuisine. We include recipes for banku and okro, banku and kontomire, tuozafi and ayoyo, jollof rice, beans and plantain, and kelewele, for 4-6 people. We hope you have a chance to try these eRecipes!

We do not attempt to capture the entire food culture of Ghana, dictated as it is by diverse geography (spanning coastal savannah, tropical forests, lowlands, uplands and numerous waterways), a tropical climate, a bountiful agricultural landscape, over 70 ethnic groups and languages, and several religions. However, we will continue testing Ghanaian dishes - breakfast, lunch and dinner preparations - using EPCs, airfryers and other electric appliances to see their compatibility and discover if they can be prepared cheaply and easily using modern energy-efficient appliances, and share our results. From the perspective of cost, compatibility, taste and convenience, our early findings are positive!

So far we have also trialled - using the controlled cooking test protocol (CCT) groundnut soup & riceballs, waakye, yam and garden egg stew, banku and tilapia, corn dough porridge, yam pottage and reheated most of the dishes, with many more planned.

To see further recipes, measurements and for more information see:

www.ecookbook.org



GHANA CULINARY TYPOLOGY

The MECS culinary approach uses surveys and cooking tests to categorise popular everyday household dishes by cooking process in order to facilitate the identification and matching of energy-efficient cooking appliances with different regional or national cuisine. Although a wide range of techniques and ingredients are commonly used in Ghana, shallow frying, boiling and simmering appear to be the dominant cooking processes, with deep frying, roasting or grilling (particularly popular with food/street vendors).

Our research identified the popularity of many starchy staples, or swallows, such as banku, tuo zaafi, or fufu; numerous stews or soups like groundnut, okro, palm nut, ayoyo, kontomire or light soup; rice dishes such as jollof or fried rice; plantain, boiled or fried; legume based dishes such as beans or waakye; porridges of e.g. millet and corn; and meat and fish, such as fried tilapia or grilled meat kebabs. We categorised them as follows (used across MECS focus countries):

Boil & stir staples	Stews & Soups	Boiled staples/vegetables	Roasted & fried
E.g.	E.g.	E.g.	E.g.
Banku	Groundnut	Jollof rice	Kelewele
Tuozafi	Okro	Rice	Plantain
(TZ)	Palm nut	Boiled plantain	Tilapia
Kenkey	Ayoyo	Yam	Kebab
Fufu	Light soup		
Porridge	0 1		

We find that modern energy-efficient appliances could be a good fit for the many common Ghanaian dishes highlighted in the culinary typology survey. Starchy boil and stir staples (e.g. banku), stews or soups (e.g. groundnut) and boiled staples or vegetables (e.g. rice) are particularly common processes, and EPCs perform these particularly effectively, and efficiently from a time and energy/cost perspective. In fact, the majority of the above categories suit an appliance such as an EPC with the exception of roasted and fried food. While not replicating the unique taste of food cooked directly over charcoal coals or in abundant oil for roasted or deep fried dishes, new energy-efficient appliances such as airfryers are coming to market and are able to adequately recreate the dishes at low cost and with health benefits.



"there should be a difference between foods cooked in the house and cooked foods bought from outsiders"

ABIGAIL

My name is Abigail Asamoah Sarpong.

I am from Atasemanso in the Ashanti region of Ghana. I learnt how to cook healthy and delicious foods from my mother. Her motto for cooking healthy food is that - as she always says -"there should be a difference between foods cooked in the house and cooked foods bought from outsiders".

I am used to cooking with LPG and charcoal. Before, my perception about cooking with electric devices such as electric cookstoves, rice cookers, kettles, among others, included the high unit cost of electricity, inconsistent electrical supply that could disrupt my cooking in cases where the power goes off and fear of electric shock when water spills on the electric cook stove whilst in the cooking process.

I began to cook local Ghanaian foods using modern energy-efficient electric cooking appliances when I joined MECS. I was introduced to electric pressure cookers, induction hobs and its cookware, and air fryers to cook the various Ghanaian recipes mentioned in this eCookbook. In choosing food recipes to cook, I concentrated on foods eaten in almost every region and across all tribes in Ghana.

My experiences with this modern cooking equipment are that they help you to cook food faster. Given the current tariff of electricity per kWh to be 1.37 GHS (as of July 2023) I show - using a power metre to take energy consumption measurements - that almost all the foods can be cooked with less than 1.5 GHS for a family of about six people. They also help in making healthy foods. An example is the use of an air fryer to bake fish or meat instead of deep frying in oil. Yellow plantain (kelewele) can be cooked in the air fryer without oil and still taste nice, as though cooked in oil.

All these times cooking Ghanaian dishes on electric appliances have made me realise that the use of modern energy cooking devices does not only save energy and money, it also protects the environment. It helps reduce the deforestation that results from high demand for charcoal and firewood used for cooking. It also saves time and helps to promote healthy cooking.



ABIGAIL'S JOLLOF RICE ON ELECTRIC PRESSURE COOKER

Rice	500g	
Chicken thighs	500g	
Tomato paste	150g	
Fresh tomatoes	2 large tomatoes (400g)	
Onions	3 medium onions (350g)	
Garlic	5 cloves (20g)	
Ginger	Medium piece (20g)	
Scotch bonnet peppers	2 (20g)	
Green bell pepper	1 medium (100g)	
Oil	200ml	
Salt	1 1⁄2 tbsp (25g)	
Ground turmeric	1∕2 tsp	
Water	500ml	For 4-6 people

Cost: 0.82 Cedis* Energy: 0.6 kWh Time: 1h 15 mins

Season & cook chicken

Cut the chicken thighs into medium sized pieces // Grind (/blend) 1 $\frac{1}{2}$ onion with garlic, ginger, turmeric and use to season the chicken // Pressure cook the seasoned chicken on high on the trivet in the EPC for 10 minutes //

Prepare ingredients

Rinse 500g of rice in fresh water and set aside //Chop the tomatoes into small pieces and set aside // Cut the onions into small slices // Cut the green bell pepper into small slices //

Make stew

Once it is ready, remove the contents of the pot using a colander, but set aside both the liquid and chicken separately to use later // Turn on high heat saute mode and add 200ml of oil // After 1 minute, add the sliced onions fresh tomatoes and cook for 10 mins with the lid open // Add tomato paste, the pieces of chicken and 500ml of water, close lid and pressure cook on high for 10 mins // Once the pot has depressurised, add the sliced bell peppers and stir well // The heat in the stew will make the bell pepper soft so there is no need to heat it. The stew is done at this stage and It can be eaten with rice cooked separately or with yam, or plantain //

Cook rice

Add the rinsed rice to the stew with 200ml of reserved liquid chicken stock // Set EPC to 15 minutes at high pressure. Depressurise and enjoy //

0.149 kWh / 0.21 Cedis

0.338 kWh / 0.47 Cedis



0.093 kWh / 0.13 Cedis

*for indicative purposes based on one CCT, see average readings in cost comparison section



ABIGAIL'S BEANS WITH PLANTAIN ON ELECTRIC PRESSURE COOKER

Black-eye beans Water Salt Palm oil Onion Mackerel (tinned) Tomatoes Pepper (scotch-bonnet) Ginger Garlic Bell pepper Plantain 500g 1litre 1 tbsp (20g) 150ml 2 onions (200g) 400g 2 medium (200g) 2 (30g) Large piece (30g) 7 cloves (30g) 100g 3

Cost: 1.32 Cedis* Energy: 0.965 kWh Time: 1 hour

For 4-6 people

Soak beans

Pre-soaking the black-eye beans from 2hours to overnight will reduce the cooking time, and save cooking energy $/\!/$

Cook beans

Cover beans with water and set to pressure cook for 10 minutes. Once cooked, depressurise, remove from pot and set aside //

Cook stew

Grind (/blend) the hot pepper, ginger, garlic, one onion with 100ml of water. Add palm oil to the EPC heat for one min and then cook blend on steam/saute for 5 minutes in hot palm oil//

Slice tomatoes, remaining onion, bell pepper add to pan. Fry for 5minutes //

Add the mackerel and cook for 2 further minutes $/\!/$

Add the drained beans to the EPC pot, mix well and cook for a further 5 minutes.

Boil plantain

Add 500ml of water to EPC and bring to boil with lid open. As soon as the water is boiling add the plantain and cook for 5 minutes//

Serve

Put beans in a dish and add chunks of plantain. Add gari if desired. Enjoy! 0.272 kWh / 0.37 Cedis

0.588 kWh / 0.81 Cedis

0.105 kWh / 0.14 Cedis



*for indicative purposes based on one CCT, see average readings in cost comparison section





Cost: 0.58 Cedis* Energy: 0.426 kWh Time: 35 mins

Plantain400g (overripe)Onion20gPepper10gGinger10gGarlic10gOil50mlSalt1tbsp

For 4-6 people

Make seasoning

Grind (blend) the pepper, ginger, garlic and salt with oil $/\!/$

Prepare ingredients

Cut the overripe plantain into small pieces (cubes), and mix with the blended ingredients $/\!/$

Airfry

Airfry for 35 mins at 200C, turning every 10-15 minutes, and checking. Some airfryers are more powerful than others!

0.426 kWh / 0.58 Cedis



*for indicative purposes based on one CCT, see average readings in cost comparison section



ABIGAIL'S BANKU WITH OKROSTEW ON ELECTRIC PRESSURE COOKER

Banku

Corn dough Cassave dough Water 1kg 300g 1 litre

Okro stew

Reef 1kg Salt 300g Okro 1 litre Mackerel 1tin Palm oil 150ml Onion 2 Pepper (hot) 2 Ginger 20g Garlic 30g Tomatoes 50g

Cost: 1.37 Cedis* Energy: 0.997 kWh Time: 1h 27mins

For 4-6 people

Boil the okro with 500ml water // Once cooked, depressurise and set aside //

Make stew

Boil okro

Grind (/blend) onion, ginger, garlic & pepper & add to the meat & boil for 10mins then add the fish to it and boil for another 5 mins with open lid high heat mode // Remove & aside //

Fry vegetables

Add palm oil, heat for 1 minute then fry cut onion, tomatoes and rest of the remaining blended ingredients for 5 minutes //

Finish stew

Add the meat, fish and cooked okro to the stew

Cook Banku

Mix corn dough and cassava dough with 1litre water to make it water in EPC pot // Put on heat with lid open and keep stirring to thicken the mixture and add salt until you reach the desired texture // Mould the banku into a rubber ball when it is ready //

0.225 kWh / 0.31 Cedis

0.260 kWh / 0.36 Cedis

0.121 kWh / 0.17 Cedis

0.103 kWh / 0.14 Cedis

0.288 kWh / 0.39 Cedis



*for indicative purposes based on one CCT, see average readings in cost comparison section





"Cooking with the pressure cooker is very easy and can cook all types of food"

ADIZATU JIBRIL "HAJIA"

created recipes and conducted controlled cooking tests

Where are you from and where do you live now?

Am from the Upper Eastern Region in Ghana. Now I have been living in Adabraka most of my life.

What is your favourite dish?

My favourite dish is Banku with okro or pepper.

How did you learn how to cook?

My mother taught me how to cook.

What did you think of cooking w/electricity before? Cost, expectations?

Before I didn't know you can use electricity to cook many things. The cost also I thought it would be expensive. The expectation, I thought you can only cook rice using the rice cooker.

And with your experience now?

And with my experience now I can cook everything with electricity.

What would you recommend other people and your friends?

I would recommend other people and my friends to use electricity to cook because it is faster and cheap.

Can you make all dishes on EPC?

Yes, you can make most dishes on an EPC.

What cooking fuels did you use primarily before?

Charcoal.

What are the best things of cooking with the electric pressure cooker?

Cooking with the pressure cooker is very easy and can cook all types of food.

What are the worse things of cooking with the electric pressure cooker?

The pressure cooker can cook all types of food but with Banku it takes little longer.

What do you think are the biggest challenges for people to start using electricity for cooking?

Cooking with the EPC is good, but the money to buy the cooker is the problem.

HAJIA'S KONTONIRE WITH YAN ON ELECTRIC PRESSURE COOKER

Yam 1.4kg Kontomire 450g Salmon (Fresh) 250g 125g Herring (Dried) 200g Agushie Salt 2 tbsp 10 (100g) - or to taste Pepper (green) Palm oil 300ml Onion 4 onions (400g) Tomatoes 3 tomatoes (500g) 8 cloves (30g) Garlic Medium piece (30g) Ginger Maggi cubes 2

Cost: 0.83 Cedis* Energy: 0.607 kWh Time: 58mins

For 4-6 people

Cook leaves

Heat 1 cup of water in EPC // Cut cocoyam leaves in small slices. Then wash briefly and add to boiling water // Set to steam, pressure cook for 2 minutes // Depressurise and set aside //

Prepare stew

Set pressure cooker to heat hot with lid off // Heat palm oil briefly then add sliced onion, then grinded (/blended) pepper and tomatoes // After a few minutes add fish // After 5 further minutes add agushie. (Don't stir, but easily move the spoon up and down to avoid the agushie from blending in too much). Add seasoning // Top-off with stirring in cocoyam leaves and leave cooking for a few minutes // Remove from pan and set aside.

Cook yam

Add 2 cups water to EPC and set to boil Peel and cut the yam into medium size pieces (half moon) // Add to boiling water and set to pressure cook for 4 minutes // 0.157 kWh / 0.22 Cedis

0.273 kWh / 0.37 Cedis



0.177 kWh / 0.24 Cedis



HAJIA'S TUOZAFI WITH AYOYO Cowmeat 250g ON ELECTRIC PRESSURE COOKER

250g Avoyo leaves 150g Dawadawa 15g Calabash nut 1 nut Salmon (fresh) 200g Herring (dried) 50g Salt 2tbsp Pepper (hot green) 50g Palm oil 350ml Onion 3 (333g) Tomatoes 3 (300g) Tomatoes (tin) 210g Garlic 5 cloves (20g) Ginger 1 medium piece (20g) Maggi 2 Corn powder 400g For 4-6 people Cassava powder 150g Water 1.5 litres

Cost: 1.34 Cedis* Energy: 0.977 kWh Time: 2h 2mins

Prepare ingredients

Marinate meat in shallow water with the blended ginger/garlic before cutting Ingredients small (cubes for tomatoes). Blend/grind all of the pepper, half of tomatoes, half of the onions. // Wash the Ayoyo leaves before cutting, otherwise the sliminess is not activated //

Cook the meat & make stew

Add a little water to the EPC pot and boil for 5 minutes. Preheat EPC pot on high, open lid, add palmoil, then sliced onion, after a few minutes add tinned tomatoes, then meat stock and salt //

Ayoyo soup

Grind (/blend) the dawada, calabash nut and herring together, add a boiling of cup of water, then add the ayoyo leaves. Add salt and seasoning to your liking. Also bitter salt for softening the leaves, before stirring //

Tuozafi

Set EPC to heat with open lid // Boil the water (1150 ml), meanwhile mix water with maize powder to get a milky substance. Mix the cassava and maize powder and slowly add it to the EPC and stir to mix well. 5. When reached its thickness cover put lid on (but not close), now wait 10 mins for TZ to be ready //

0.382 kWh / 0.52 Cedis

0.161 kWh / 0.22 Cedis



0.434 kWh / 0.59 Cedis



"The electric pressure cooker can cook most of my favourite food."

SALAMATU "SALA"

conducted controlled cooking tests

Where are you from and where do you live now?

I am from Adabraka (Accra) and still live here.

What is your favourite dish?

My favourite dish is Jollof rice.

How did you learn how to cook?

My grandmother taught me how to cook.

What did you think of cooking w/ electricity before? Cost, expectations?

I thought it would be very expensive to use.

And with your experience now? Very economical.

What would you recommend other people and your friends? To use the Electric Pressure Cooker.

Can you make all dishes on EPC?

Yes.

What cooking fuels did you use primarily before?

Charcoal and LPG.

What are the best things of cooking with the electric pressure cooker?

The electric pressure cooker can cook most of my favourite food and would also be great for Palmnut Soup and Riceballs.

What are the worse things of cooking with the electric pressure cooker?

You can't make fufu [there's no automatic pounding function].

What do you think are the biggest challenges for people to start using electricity for cooking?

The money to buy the electric pressure cooker is the problem.



COOKING FUELS COST COMPARISON

We conducted the fuel comparison research predominantly in Accra. The participating cooks used LPG and charcoal as primary cooking fuels before being introduced to electricity, which they already had access to but did not use significantly for cooking. We repeatedly cooked dishes using the same quantity of ingredients on EPCs, airfryers, LPG cylinders (one burner) and charcoal stoves (coal pot). eRecipes and electricity usage readings were verified both in Ghana and internationally, using controlled cooking tests (CCT). We have provided the average measurements from the repeated tests.



COOKING FUELS COST COMPARISON



JOLLOF RICE

We were able to conduct tests for jollof rice on additional electric cooking appliances. Using relatively inefficient appliances such as an electric hotplate still offered significant savings of around 40% with LPG and charcoal, as compared to EPC, which offers savings of around 70%. The EPC and induction hob were the cheapest options!

OVERALL COOKING TEST

We took the measurements of all our controlled cooking tests using different fuels and compared the averages. Charcoal proved the most expensive fuel, with LPG coming in a little cheaper, and electricity over 50% cheaper overall. Although prices have fluctuated between 2022 when the tests were conducted with price rises, according to our tests electricity remains the cheapest cooking fuel even at 2023 prices. [Electricity +53.8%, LPG +13.9% & Charcoal +21.1%]



COST COMPARISON JOLLOF RICE



Jollof rice cooked on an EPC is more than 2.5x cheaper than using common cooking fuels such as LPG or charcoal. Using a relatively inefficient electric cooking appliance such as an electric hotplate is still half the price. Electricity is therefore 2-3 times cheaper than any other cooking fuel for cooking jollof rice!

EPC Cost: 0.92 Cedis Energy: 0.67 kWh Time: 1h 15 mins

LPG

Cost: 2.28 Cedis Weight: 180 grams Time: 1 hour 11 mins

HOTPLATE

Cost: 1.12 Cedis Energy: 1.40 kWh Time: 1 hour 8 minutes

CHARCOAL

Cost: 2.24 Cedis Weight: 725 grams Time: 1hour 38 mins

INDUCTION

Cost: 1.12 Cedis Energy: 0.820 kWh Time: 50 mins

Av. Cost of cooking fuel - Jollof Rice



COST COMPARISON BEANS STEW WITH PLANTAIN



EPCs can cook beans and plantain at a fraction of the cost of charcoal and LPG, coming in at almost 3 times cheaper! For long-boiling dishes, pressure cooking comes with a significant advantage in that it can cook at a higher boiling point in a sealed container, reducing heat loss. Charcoal, where a lot of time and energy is invested in lighting the fuel, (averaging 12 minutes) holds temperature for a long time, so in this instance, has some economy over LPG on long-boiling dishes like beans.

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plantain

4

Cedis

Av. Cost of cooking fuel - Beans stew with



EPC

Cost: 1.07 Cedis Energy: 0.782 kWh Time: 1 hour 6 mins

LPG

Cost: 3.26 Cedis Weight: 260 grams Time: 1 hour 23 mins

CHARCOAL

Cost: 2.92 Cedis Weight: 940 grams Time: 2 hours 2 mins





COST COMPARISON KELEWELE



Using an airfryer was comparable to deep frying on LPG or charcoal in price. However, using an airfryer would be much cheaper if adding the cost of cooking oil: an airfryer needs negligible amounts of oil to cook effectively! On top, cooking with an airfryer is considered considerably healthier, compared to the other methods which require immersion of the plantain in oil. However, frying on LPG is by far the fastest way to cook kelewele, at 13 minutes compared to 35 minutes (airfryer) or 50 minutes (charcoal stove).



Average Cost of cooking fuel - Kelewele

Cedis

AIRFRYER Cost: 0.58 Cedis Energy: 0.426 kWh Time: 35 minutes

LPG Cost: 0.54 Cedis Weight: 43 grams Time: 13 minutes

CHARCOAL

Cost: 0.57 Cedis Weight: 183 grams Time: 50 mins

COST COMPARISON BANKU WITH OKRO STEW



Overall, this recipe proved the costliest from a fuel and energy perspective of our tests. The EPC made effective gains for essential boiling processes in making the okro stew. Banku consumes however much more energy for cooking it as it requires frequent stirring and steady heat and an open lid. Nonetheless, the EPC is still 2x cheaper than Charcoal and 1.5x cheaper than LPG.

EPC

Cost: 1.44 Cedis Energy: 1.049 kWh Time: 1 hour 23 mins

LPG

Cost: 2.40 Cedis Weight: 190 grams Time: 1 hour 10 mins

CHARCOAL

Cost: 4.17 Cedis Weight: 1.346 grams Time: 1 hour 42 mins 4

5

Cedis

Av. Cost of cooking fuel - Banku with okro



COST COMPARISON KONTOMIRE WITH YAM



For Kontomire and yam, EPCs are around 2.5 to 3.5 times cheaper than using LPG or charcoal stoves respectively and the EPC was also slightly faster than using LPG, with charcoal taking just over 20 minutes longer on average.

EPC

Cost: 0.92 Cedis Energy: 0.669 kWh Time: 51 minutes

LPG

Cost: 2.38 Cedis Weight: 188 grams Time: 55 minutes

CHARCOAL

Cost: 3.18 Cedis Weight: 1028 grams Time: 1hour 17 mins

Av. Cost of cooking fuel - Kontomire with yam

4



COST COMPARISON TUOZAFI WITH AYOYO

There are significant savings to made using an EPC to cook TZ with an EPC. It is over 2x times cheaper than LPG, and almost 3x cheaper than cusing charcoal to prepare TZ. The time gains of LPG are especially to be accounted for the longer process of making TZ in the EPC.

$\frac{3}{1}$ $\frac{3}{1}$ $\frac{3}{1}$ $\frac{1}{1}$ $\frac{1}$

Average Cost of cooking fuel - Tuozafi

EPC Cost: 1.39 Cedis Energy: 1.01 kWh Time: 2 hours

LPG

Cost: 2.83 Cedis Weight: 223 grams Time: 1hour 23 mins

CHARCOAL

Cost: 3.96 Cedis Weight: 1279 grams Time: 2 hours 26 mins // All the featured dishes cooked with an EPC in this eCookbook cost an average of only 1.15 Cedi //

// Before we started cooking, we asked our Ghanaian participants what they expected to pay for cooking Kontomire with Yam on an EPC. The EPC beat their expectations by more than 10 times! //

> // No participant or invitee to the tasting of the meals preferred the charcoal cooked meals. In some cases the dishes cooked with the EPC were even preferred! Smoother in texture (Banku) or more flavourful (Kontomire stew) //



CONCLUSIONS

Can you cook Ghanaian food using energy-efficient appliances?



We have successfully tested banku & okro, kontomire, tuozafi & ayoyo, jollof rice, beans & plantain, kelewele, groundnut soup & rice balls, waakye, yam and garden egg stew, banku and tilapia, corn dough porridge, yam pottage with EPCs and airfryers. And more to come!

How much does electricity cost to cook with, and how does it compare to common fuels?



Electric cooking can be significantly faster, and convenient especially in comparison to charcoal. Charcoal is slowest on all instances compared to EPC and LPG and took an average of 12 minutes to light before the actual cooking could even start. Almost all the foods can be cooked, with around 1.5 Cedi or less, depending on the type of device used and the cooking process. As shown in the comparison graphs above, cooking with electricity has proven to be cheapest when compared with other cooking fuels, especially on longboiling and heavy foods, and especially when using the EPC.

How about taste, and convenience? CHEAP, CONVENIENT, TASTY & FAST!

All foods prepared on different fuels were compared in taste. None of the foods prepared with an EPC came out less tasty than with LPG, or Charcoal, while most dishes were praised because the richness of flavour! More flavour - and nutrients! - remain in the pot while cooking. And because on average it takes less time to cook using an EPC, and there are lots of automatic features, it was considered a highly convenient device. It is also fast, across the fives dishes prepared, using an EPC reduces cooking time by an average of 30%. over charcoal. The EPC was considered very easy to clean and store after use, compared to an LPG cylinder in single rooms, lacking kitchen space.

RECOMMENDATIONS

For cooks

Given the energy efficient and potential to save time cooking with electricity, it is recommended that commercial and domestic cooks make use of modern electrical devices. Higher uptake of the use of these devices will reduce the cost of producing tasty Ghanian food in a timely way.

For policymakers

Ghana has made tremendous progress in connecting households to the electrical grid that now has surplus in power generation. Improving the quality of infrastructure is key. So even though Ghana is also a producer of fossil fuels such as LPG, encouraging the population to cook with electricity would have multiple effects. In as much as it helps to make cooking easier at less cost, it also helps to provide employment for those engaged in its production, sales and use. It is recommended that policies should be made to make the sector lucrative for people to invest in. These measures can be in the form of providing adequate infrastructure to promote production or assembling of devices other than imports. The use of various subsidies could also support manufacturers to increase its production.

For livelihood programmes

The strategic use of electrical energy efficient appliances can reduce cooking costs for consumers, release time that can be used for productive use or leisure, mitigate the impact of household air pollution on the families health, and create new opportunities for income development. It is suggested to be of importance in institutional and humanitarian settings. Some provision to help spread the upfront costs of the appliances can be made through savings and credit organisations, or 'pay as you go' arrangements, to further investigate. Same goes for improving the quality of the electricity grid in urban informal settlements.

For the private sector

Globally there are many manufacturers of these energy efficient devices, although localised Ghana production and assembly has yet to be developed. A growing distribution of the global products is being taken up by online distributors, but there are many opportunities for women led demonstrations and community driven distribution and sales of these energy efficient appliances.

For the future

All the above stakeholders could work together to create a change that reduces household and business expenses when cooking, and creates a new atmosphere in Ghana; clean air in the kitchen, cleaner air, reduced climate emissions, and an environment that leads to improved economic and leisure lifestyles. It is pertinent that in this day and age no one is left behind and everyone can benefit from these great opportunities, equally.

With thanks

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Appliance specifications

EPCs: AKAI 6L PCK001A-D602 | Tefal 5.8L CY55E40 | Crockpot 5.6L CSC051 | Sage 6L BPR700 // Airfryers: Silver Crest 6L S-18 | Cosori 3.5L CP137-AF Tristar 2L FR- 6980// Induction: Ciarra CBTIH1 | Buffalo 3kW CE208 //Hotplates: DZire HPSD2500-TH04D | Cookworks hotplate 949/5331 |

The Ghana eCookbook is a publication by the Modern Energy Cooking Services Programme and forms part of its series of eCookbooks.

This updated eCookbook aims to shed light on three particular research questions: 1) can popular Ghanaian foods be cooked using modern energy-efficient devices, 2) on a dish by dish basis, how much electricity does it consume and how does it compare to common cooking fuels? 3) Is it convenient and how does the taste compare?

By exploring the relationship between energy use and cooking we hope this book can inform cooks on how best to take advantage of the opportunity to cook using electricity in Ghana in 2023, and beyond.



"Before I didn't know you can use electricity to cook many things... And with my experience now, I can cook everything with electricity."

Hajia