INDIA ECOOKBOOK

ELECTRIFYING INDIAN KITCHENS

MECS Modern Energy Cooking Services

finovista

The India eCookBook was developed by Finovista, the country partner for the Modern Energy Cooking Services (MECS) Programme in India. It is part of a series of MECS eCookBooks that seek to highlight the compatibility of modern energy-efficient appliances with local cuisines.

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INTRODUCTION

OVERVIEW

India is now an **electricity surplus nation** with almost universal access to an increasingly reliable supply of electricity, however, there is still negligible use of electricity for cooking.

As a result, the Government of India recently launched the **Go Electric** campaign to catalyse the electrification of transportation and cooking.

This eCookBook will take you on a culinary journey across India, exploring the role that **energy-efficient** eCooking appliances could play in modernising Indian kitchens.

It presents the findings from a study of Indian cooking culture and a set of **kitchen laboratory** experiments.

It explores the feasibility of cooking popular Indian dishes with an **Electric Pressure Cooker (EPC)** and compares the cooking experience to the two most popular modern alternatives in India today: induction and LPG.

The results are presented as a series of eRecipes that compare the energy consumption, time and cost required to cook each dish.

KEY FINDINGS

The Kitchen Laboratory experiments in this eCookBook compared Electric Pressure Cookers (EPCs) to induction with a conventional pressure cooker and showed that:

Most everyday Indian dishes can be cooked using an EPC

around

85%

of typical weekly menu can be cooked with an EPC

Indian households could make substantial cost savings

savings on pressure cooked, steamed & boiled dishes of up to:

40% vs. subsidised LPG + pressure cooker

60% vs. induction + pressure cooker

EPCs are extremely convenient allowing multi-tasking

- **fully automated**
- **pre-set menus**
- **can be left unattended**

EPCs can achieve superior texture and flavour blends with dal

"Rajma Masala flavours blended well and the gravy had a thick consistent texture"

The evidence in this eCookBook shows that **an EPC can be a valuable complement to an Indian kitchen**. An EPC can very efficiently replace conventional pressure cookers, idli makers, steamers and rice cookers and other utensils partially and thus, **it is likely to be a valuable tool for the electrification of Indian kitchens.**

INDIA'S COOKING SCENARIO

Regional cooking culture

Northern India

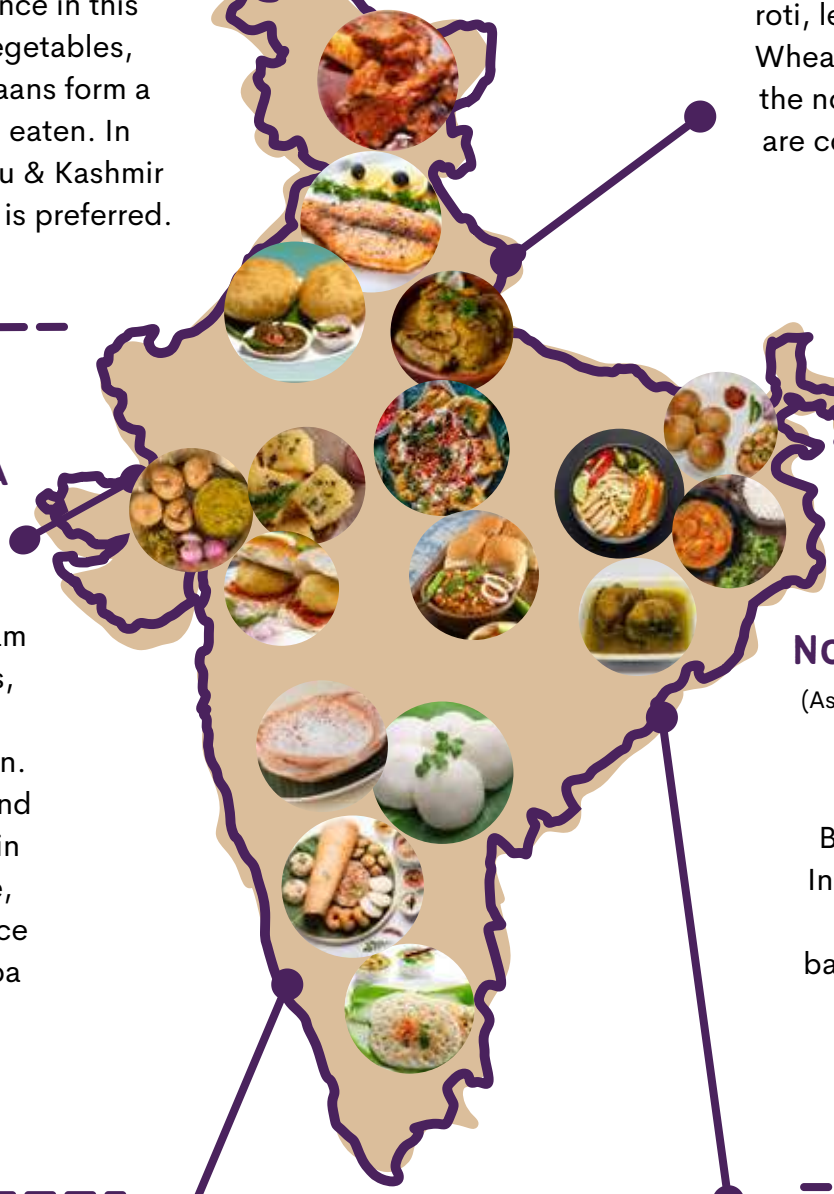
(Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir and Uttarakhand)

Dairy and an assortment of bread have a huge presence in this region. Dal, dry vegetables, Tandoori roti and naans form a major part of food eaten. In Himachal and Jammu & Kashmir non-vegetarian food is preferred.

Central India

(Uttar Pradesh, Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh and Orissa)

Vast majority of the states are vegetarian and prefer dal (cereal), roti, lentils, rice and vegetables. Wheat and meat are common in the north and west; rice and fish are common in south and east.



Western India

(Rajasthan, Gujarat, Maharashtra and Goa)

Corn, lentils, and gram flour, as well as nuts, are staple foods in Gujarat and Rajasthan. Fish, rice, coconut, and peanuts are staples in Maharashtra cuisine, and fish, pork, and rice are the staples of Goa cuisine.

North Eastern India

(Assam; Meghalaya; Tripura, Manipur; Mizoram; Nagaland; Arunachal Pradesh)

Blend of Chinese and north Indian cuisines. Staple foods are rice, fish, pork meat, bamboo vegetables and leafy vegetables.

Southern India

(Andhra Pradesh, Tamil Nadu, Karnataka, Kerala)

In spite of variations across the states, the food is known for its spicy curries with rice as the major staple food. Seafood, spices and coconut products have a significant presence.

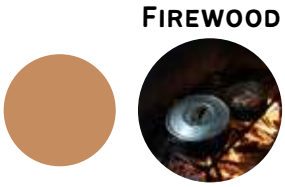
Eastern India

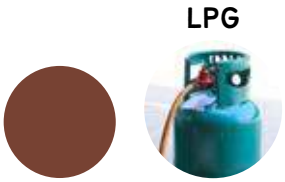
(West Bengal; Bihar; Jharkhand; Sikkim; Orisaa)

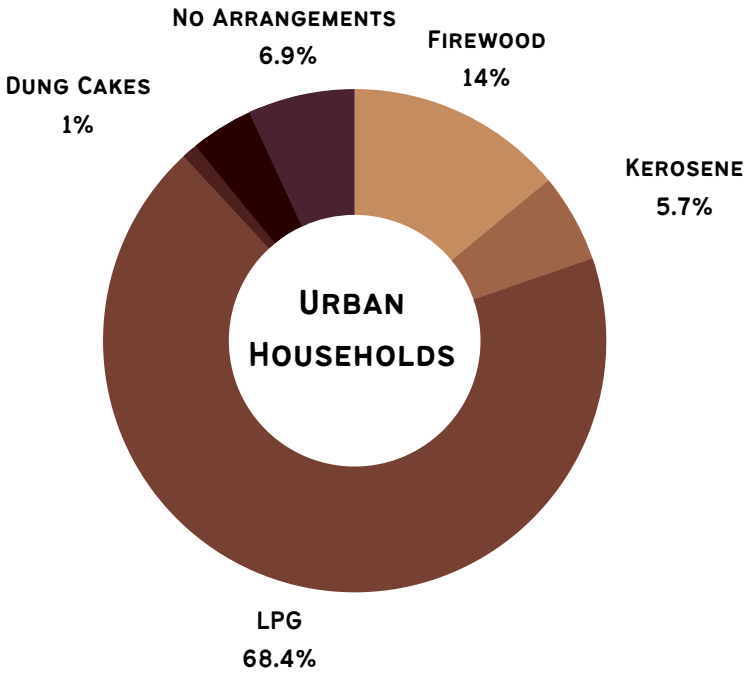
Contains significant amount of sweets, fish and other seafood. Use high amounts of spice. Staple foods are: rice, fish, vegetables and lentils. Various ethnic groups have their own distinct cuisines.

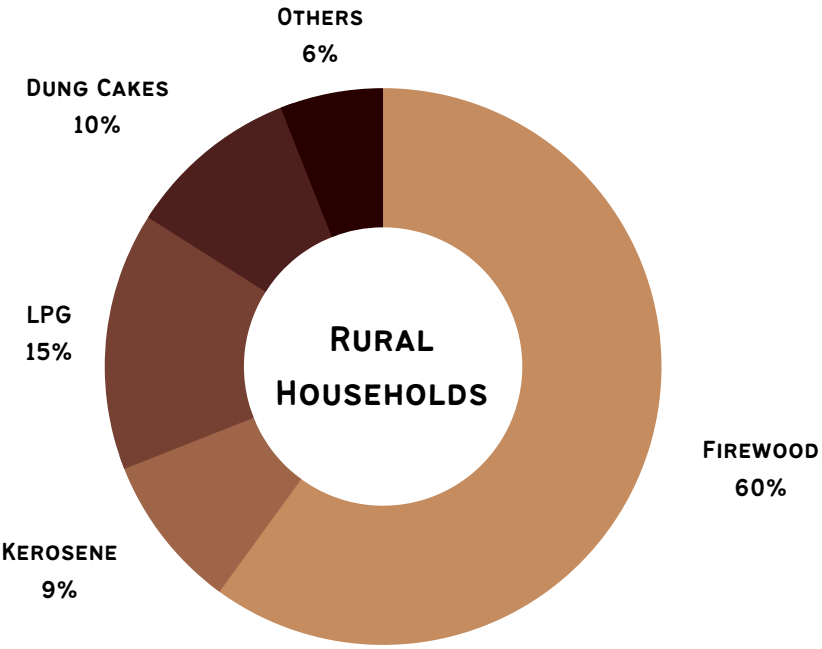
Cooking Fuel Scenario

The latest comprehensive national-level survey was conducted by National Sample Survey Office (NSSO) in 2011/12, showing that nearly two-thirds of rural households in India use firewood and cow dung as their primary cooking fuel and two-thirds of urban households primarily cook with LPG.









Under the **Pradhan Mantri Ujjwala Yojana (PMUY)** initiative, India has reportedly achieved 99.8% LPG coverage in April 2021. However, issues such as refilling, distribution, and consumer adaptation mean that fuel stacking persists and as a result, biomass and kerosene are still widely used in households across India as both primary and secondary cooking devices.

Cooking patterns

6 AM — **Breakfast** — 10 AM — 12 PM — **Lunch** — 4 PM — 6 PM — **Dinner** — 10 PM

7 AM - 9 AM | **1 PM - 3 PM** | **7 PM - 9 PM**

Breakfast	Lunch	Dinner
Eggs Indian Bread Cereal Porridge Batter Cake	Dal Rice Indian Bread Curries Dry/Gravy Vegetables Dishes	Dal Rice Indian Bread Curries Dry/Gravy Vegetable/Non Vegetable Dishes
Tea Coffee Milk	Curd Buttermilk	Soup Curd Buttermilk

ECOOKING IN INDIA

Why should India shift to electric cooking?

Reduced reliance on imports

With 99.8% LPG penetration in 2021, India pays a huge cost for importing LPG. India is an electricity surplus nation, replacing LPG with electricity would reduce import costs drastically and help India move towards being self-reliant, aligning with its "Make in India" & "Atmanirbhar Bharat" vision.

Improved Electricity Access

99.99% of households in India are electrified, with quality electricity supply increasing in more communities, electric cooking has become viable.

Greener regime for cooking

India generates 40% of electricity through renewable sources and this contribution is increasing every year. Replacing LPG with electricity would help India move towards a greener energy regime and towards its commitment to net zero emission by 2070.

Why should India shift to electric cooking?

Widely available electric cooking appliances

A wide variety of energy efficient electric cooking appliances are available in physical stores and online markets. Increased consumer demand is clearly evident with the launch of In-house labels by Leading retailers eg Re-connect by Reliance Digital and Amazon Basics by Amazon, Croma by TATA.

100% of Indian cooking possible

This cookbook evidences that all types of multi-ethnic Indian dishes can be cooked using a combination of Induction Cookstoves and efficient devices like Electric Pressure Cookers (EPCs).

Cheaper & convenient for consumers

To make LPG cooking viable, a high subsidy brunt is borne by the Government. This cookbook evidences that by going electric, cooking can be much more convenient and both households and government can make substantial savings (Please refer to page no. 54)

Cost Comparison

Typical upfront costs

ELECTRICITY **VS.** **LPG**

eCooking with induction has a **lower upfront cost** than LPG,

WHILE

the cost of induction cooking is **lower than unsubsidised LPG**, it is higher than subsidised LPG.

9600 INR

4600 INR

Induction Stove
INR 1600

Steel Cooking Utensils
INR 3000

EPC
INR 5000

Cylinder + Regulator
INR 1450 (Refundable)

Cooking Utensils
INR 2100

Gas Stove
INR 1700

5250 INR

eCooking with induction + EPC has a higher upfront cost than LPG,

HOWEVER

the cost of cooking with induction + EPC is **comparable to subsidised LPG**.

NOTE

The affordability of electric cooking devices can be increased dramatically through demand aggregation, carbon financing and digital financing

Typical costs of cooking

ELECTRICITY

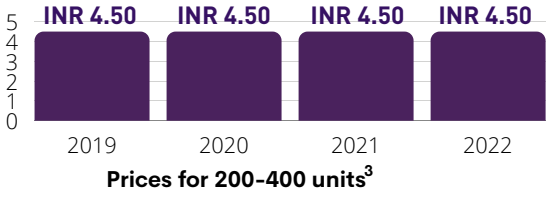
NITI Aayog: **1,022 kWh/yr** for family of 4 to cook all food with induction.[1]

@ 5 INR/kWh

Induction: **5110 INR/yr**

@ 5 INR/kWh

Induction + EPC[4]**: 3832 INR/yr**



Prices for 200-400 units[3]

VS.

LPG

NITI Aayog: **8 refills per year** for family of 4 to cook all food with LPG.

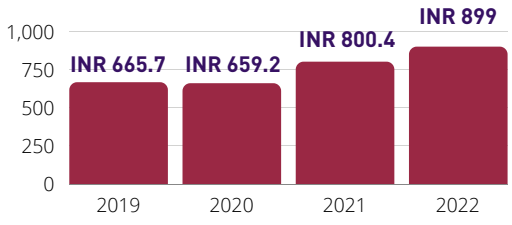
@ 899 INR/refill unsubsidised price

Unsubsidised LPG: **7192 INR/yr**

@ 450 INR/refill subsidised price

Subsidised LPG: 3600 INR/yr

Unsubsidised LPG prices are **steadily increasing**[2]



NOTE

In this document we use the standard tariff cost of a unit of electricity, but some Indian states like Delhi offer first 200 units as free electricity to all households. If households are not fully using their allowance of free electricity, then cooking can be even cheaper than quoted here.

1.NITI Aayog (n.d.) "User guide for India's 2047 energy calculator cooking sector," NITI Aayog
2. https://iocl.com/indane-14.2Kg-nonsubsid-previous-price
3.http://www.derc.gov.in/sites/default/files/Press%20Release%202022%20Eng%2030.09.2021.pdf
4. The evidence in this eCookBook shows that the EPC reduces the cost of each dish by ~50%. If the EPC cooks 50% of the weekly menu, the total cost of cooking would reduce by 25%.

WHY AN ELECTRIC PRESSURE COOKER?

Delicious Food

Food cooked on an **EPC tastes good and flavours blend well** due to even heating of the cooking device

Pollution Free

Cooking with electricity is **safe and causes no harmful effect on health** and environment due to emissionless cooking.

Safe

EPCs have multiple safety mechanisms which includes a pressure release valve, pressure sensor, thermal fuse, locking pin, and temperature sensor.

Efficient

EPC is most efficient at cooking heavy dishes by **greatly reducing energy consumption.**

Multi-functional

EPC can easily replace many devices like saucepan, kadhai, idli maker, wok, etc.

Convenient

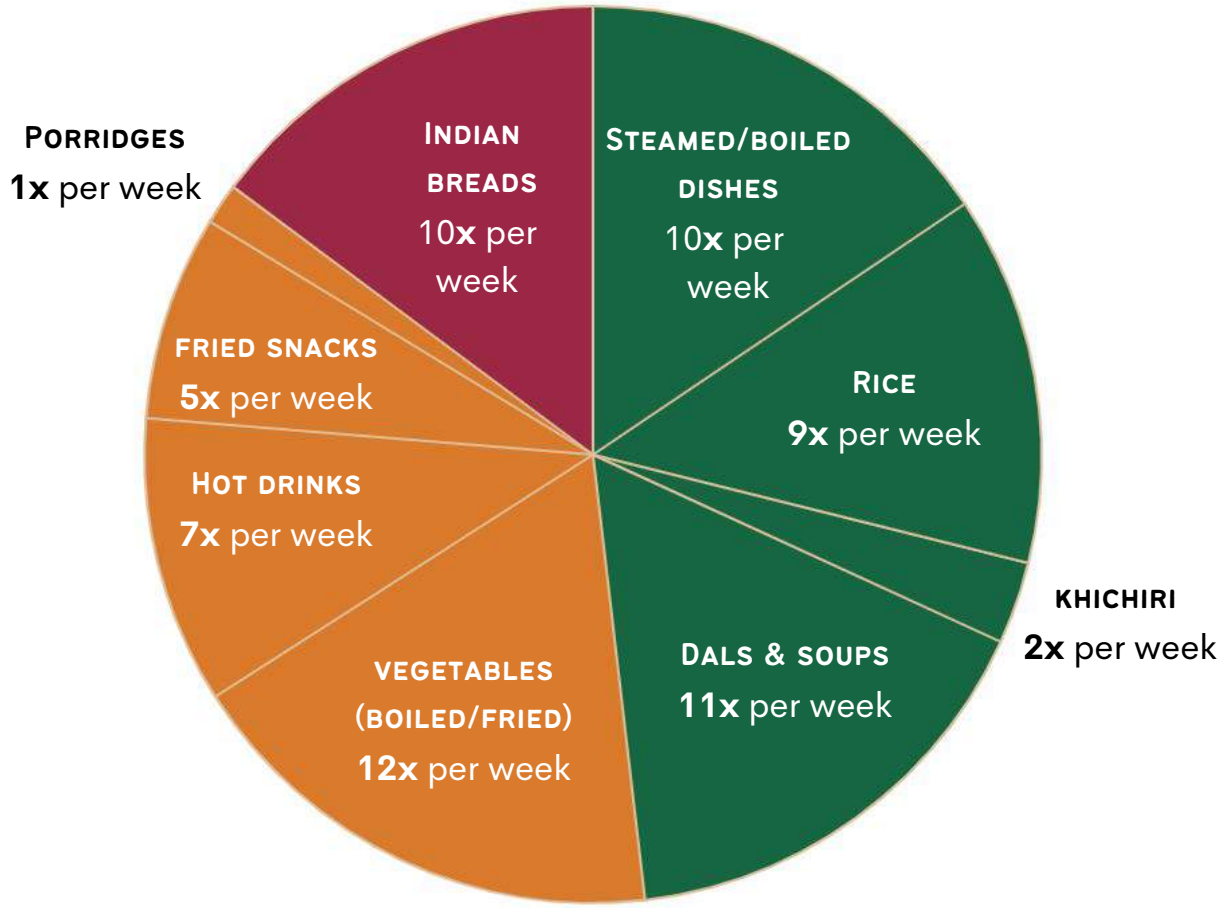
EPC has multiple pre set menus for cooking various types of Indian dishes using processes like steaming, boiling, sautéing, baking, etc. **Automated cooking process leads to easy handling and minimum intervention.**

The Evolution of Pressure Cooking in India

Past	Present	The Future
		
HEAVY POT ON BIOMASS STOVE	PRESSURE COOKER	ELECTRIC PRESSURE COOKER
Cooking Time		
Takes **2-3 hours** to cook pulses and rice.	Very fast compared to traditional pots, can cook in 15 to 40 minutes	Efficient in cooking slow-cooked dishes, dals and rice can be prepared b/w **20-30 mins (including pre-heating)**
Safety		
Causes respiratory diseases due to household air pollution & may lead to severe burns	Pressure cooker may burst sometimes and steam released while device whistles can be harmful	**Multi-layered safety mechanism.**
Versatility		
Require different utensils to prepare the meal.	**Faster, more efficient and can perform multiple functions i.e. steaming, sautéing, boiling, etc.**	Potential to replace multiple cooking utensils in Indian Kitchen
Convenience		
Constant monitoring is required to prevent burning & overcooking.	Discomfort due to steam & whistle noises & requires constant intervention	Automated and multiple pre-set menus for cooking a variety of dishes enable **multi-tasking**

WHAT PROPORTION OF A TYPICAL INDIAN MENU COULD BE COOKED WITH AN EPC?

In an average week, a typical vegetarian household in North India might cook:



= EPC is best choice for these dishes

= EPC likely to be used sometimes for dishes in these categories

= not possible to cook with an EPC

+ = **85%** of dishes on this menu can be cooked using an EPC

= **The EPC is likely to be the first choice for 48%** of this menu

KITCHEN LAB

KITCHEN LAB

A detailed cooking culture study was conducted for India, including the study of fuel and cooking utensils usage across the country. The study highlighted that in India, the choice of dishes, ingredients, seasoning, and flavors changes from one region to another and at times within the region too. Broadly, the country has 5 clear regional divides based on climate, geographic and cultural differences (see Regional Cooking Culture page above).

For this study, a total of **24 dishes from staple and popular dishes** across regions were selected, reflecting the larger Indian palate. Dishes were prepared for a family size of 4 people, using 3 liter - 750 watts EPC, and 1300 Watt Induction. Detailed recipes with ingredients and cooking processes were captured along with energy & time consumed for all the dishes on EPCs. Additionally, observations for convenience, taste, safety, and feasibility were captured. Also, a comparison of EPC vs induction and LPG (with a stove-top pressure cooker) was carried out during the study, and energy, time, and cost analysis were conducted.

The per-unit (kWh) cost of electricity used to calculate the cost of cooking is assumed as ~**INR 5***. For LPG, per unit (kg) costs of INR 63 (unsubsidised) and INR 32 (subsidised) were used.

- http://www.derc.gov.in/sites/default/files/Press%20Release%202022%20Eng%2030.09.2021.pdf

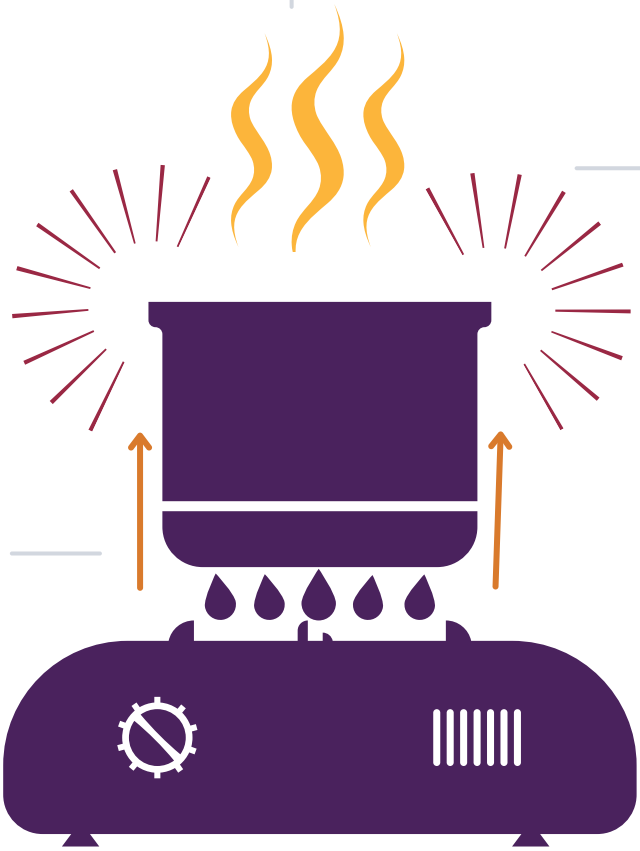
Opportunities for Efficiency Gains

Conventional cooking techniques waste energy through a variety of mechanisms, creating opportunities for modern appliances to reduce energy consumption.

Lower energy consumption = cheaper cooking.

Heat loss by **evaporation** if lid not used

Slow cooking times with unpressurised pot



Heat loss via **radiation** out the sides of the pan

Heat loss via **convection** up the sides of the pan

Heat levels manually controlled by user

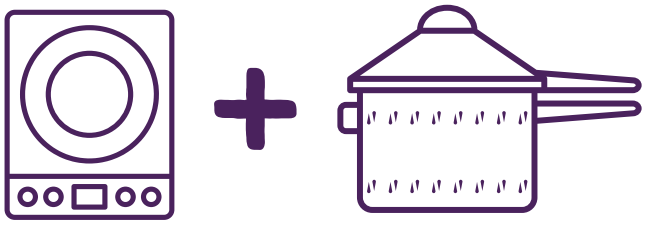
Opportunities for Efficiency Gains

Induction stoves and pressure cookers can substantially reduce energy losses during the cooking process.

Induction + Pressure Cooker

Electro-magnetic heat transfer

reduces heat lost by convection up the sides of the pan, but does not mitigate heat lost by radiation from the sides of the pan



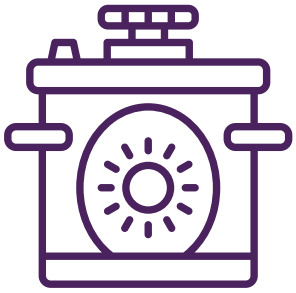
Pressurised lid

reduces cooking time & reduces evaporation

Electric Pressure Cooker

Insulation

reduces heat lost by convection up the sides of the pan & reduces radiation from the sides of the pan



Pressurised lid

reduces cooking time & reduces evaporation

Automation

turns off heating element as soon as operating pressure reached

Electric Pressure Cookers combine insulation, pressurisation and automation to deliver an extremely energy-efficient cooking service.

Electric Pressure Cooker

Performance

Can deep fry?	Selected models only
Adjustable temperature	Selected models only
Easy to clean?	Yes
Typical capacity	3-8L
Typical upfront cost	5000 INR
Additional utensil cost	N/a

Versatility

Excels at boiling & steaming, but can also sauté. Some models can also deep fry and bake. Capable of cooking up to 85% of a typical Indian household's weekly menu. Pressurisation process can be efficiently carried out.

Cost-effective

Big energy savings on boiling. No extra utensils are needed.

Induction Stove

Performance

Can deep fry?	Yes
Adjustable temperature	Yes
Easy to clean?	Yes
Capacity	N/A
Typical upfront cost	1600 INR
Typical additional utensil cost	3000 INR

Versatile

Able to cook all dishes on a typical Indian household's weekly menu, but requires steel utensils. Capable of boiling, sautéing, deep-frying, roasting, chapati making and puffing.

Compatible utensils

Cooking with induction requires flat-bottomed steel utensils like **tawa, wok, pan and pressure cooker**.

RECIPES

KITCHEN LAB MENU

These dishes were slected for testing in the Kitchen Lab as they all require boiling/steaming, which is what the EPC does best.

Dal dishes

- Masoor Dal
- Tuar Dal
- Yellow Moong Dal
- Chana Dal
- Dal Makhni
- Rajma Masala

Steamed/Boiled Dishes

- Boiled Aloo
- Boiled White Peas
- Rava Idli
- Boiled Rajma
- Boiled Chole
- Momos
- Boiled Vegetables

Vegetables

- Aloo Beans (dry)
- Aloo Gobi Matar
- Aloo Gobi Sabji (dry)
- Aloo Soya Matar
- Palak Paneer
- Pao Bhaji
- Vegetable Jalfrezi

pressure

saute

Khichri

- Mixed Dal Khichri
- Vegetable Dalia Khichri

Rice

- Steamed Rice
- Jeera Rice
- Vegetable Briyani
- Peas Pulav

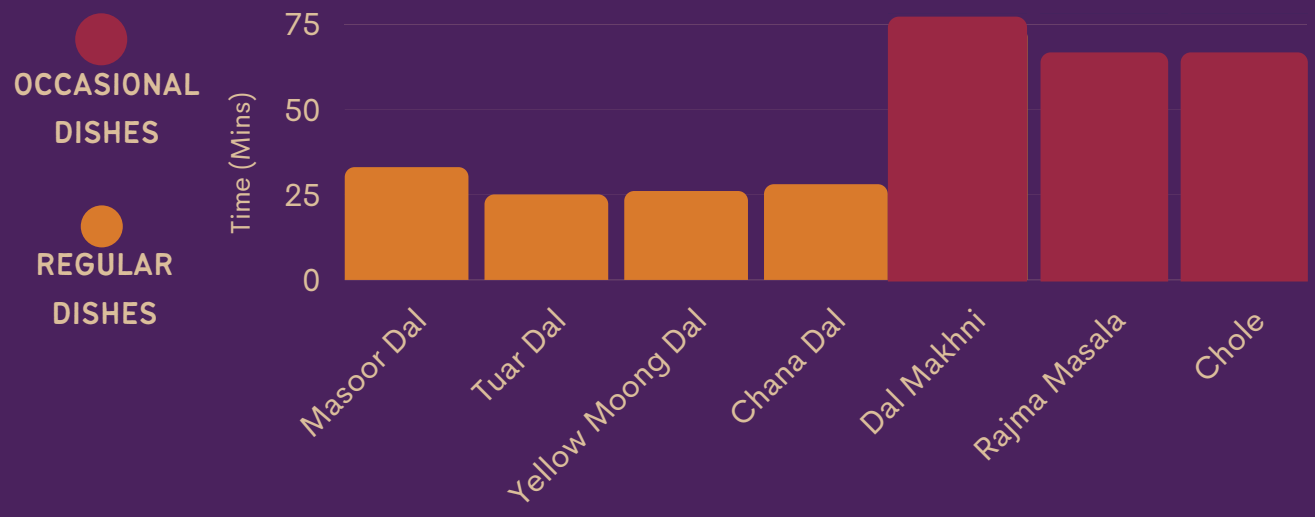
DAL DISHES

- Indians enjoy their favorite dals every day with, either Rice or Chapati/other bread-like Naan, Missi Roti, Bati, etc.
- A typical Indian household might consume dals for lunch and/or dinner most days of the week. In urban households, they are usually prepared in a pressure cooker and in rural households using either metal pots cum handi or thick bottom metal topes.
- Choice, preparation and flavour of dals change from one region to another.
- Dal is the largest source of protein, especially for the vegetarian population.

EPC Efficiency with Dals

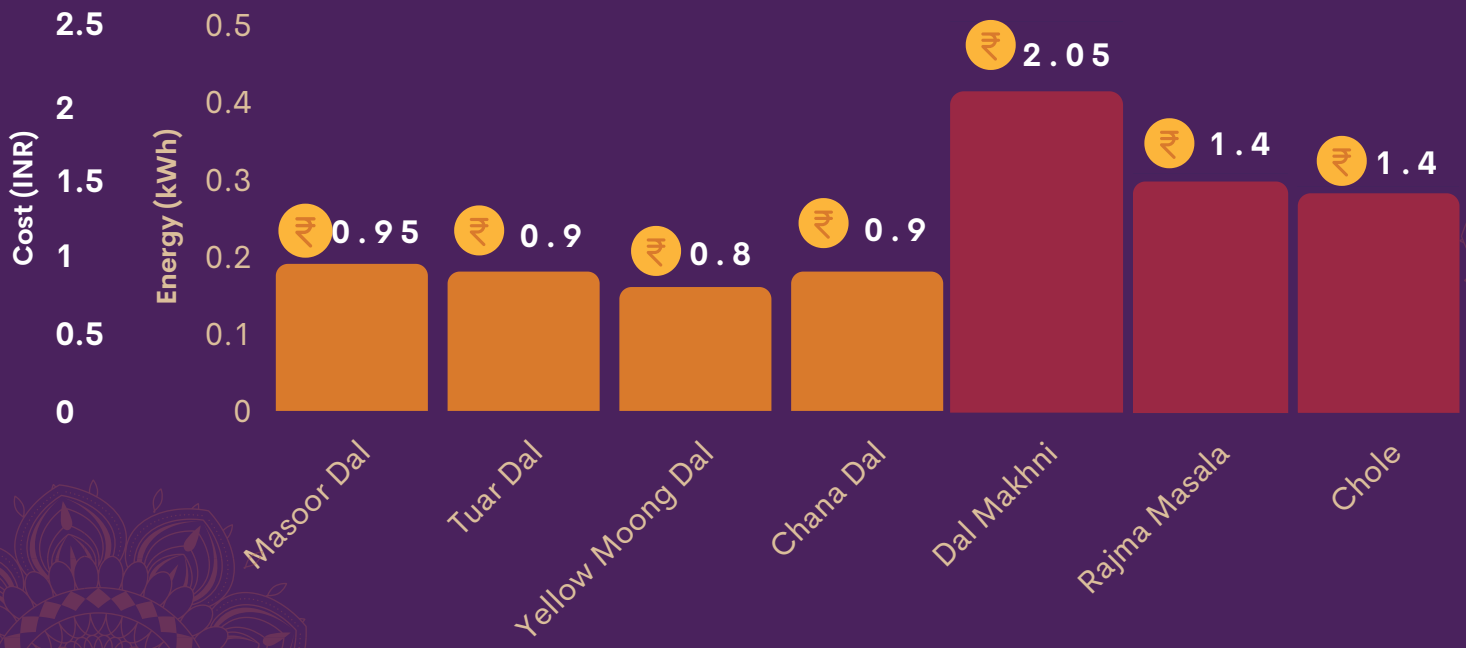
Time Findings

Commonly consumed dals like tuar dal, masoor dal, yellow moong dal, and chana dal can be easily prepared between 20-25 minutes in an EPC. Other slow-cooked and occasional dal dishes like rajma, chole, and dal makhani can also be efficiently cooked within 60-75 minutes.



Energy & Cost Findings

Dals are consumed on a daily basis and can be cooked efficiently using an EPC. Regular dals can be cooked at a cost of INR 0.80 per serving for 4 members as it consumes 0.16kWh energy on an average. Heavy dals require the most energy (0.41kWh). The maximum cost of preparing heavy pulse is INR 2.05.



Rajma Masala

INGREDIENTS

- 200 Grams Rajma,
- 4 cups water
- ½ Cup tomatoes chopped,
- ½ cup onions chopped,
- 1 tablespoon ginger garlic paste
- ½ tsp turmeric
- 1 tsp chili powder
- 1 tsp coriander powder
- 1 tsp cumin powder
- ½ tsp garam masala
- Salt to taste

PROCESS

PROCEDURE

01 PRESSURE

Soak Rajma Beans overnight and pressure cooked for **30 Minutes** in an EPC (14 mins pre-heating and 30 mins pressure cook) and 30 mins on Induction cooktop.

02 SAUTE

Pre-heat (3 mins), add 1tbsp oil, fry spices (1 min), and saute onion, tomatoes with powder spices (up to 5 mins) using "saute" mode on an EPC and manually set the wattage between 500-800 and saute for 15 mins on Induction cooktop.

03 PRESSURE

Add steamed Rajma and water and salt to taste. Close the lid & set to pressure cook for 12 mins in an EPC (7 mins pre-heating & 5 mins pressure cook) and 5 mins on Induction cooktop.

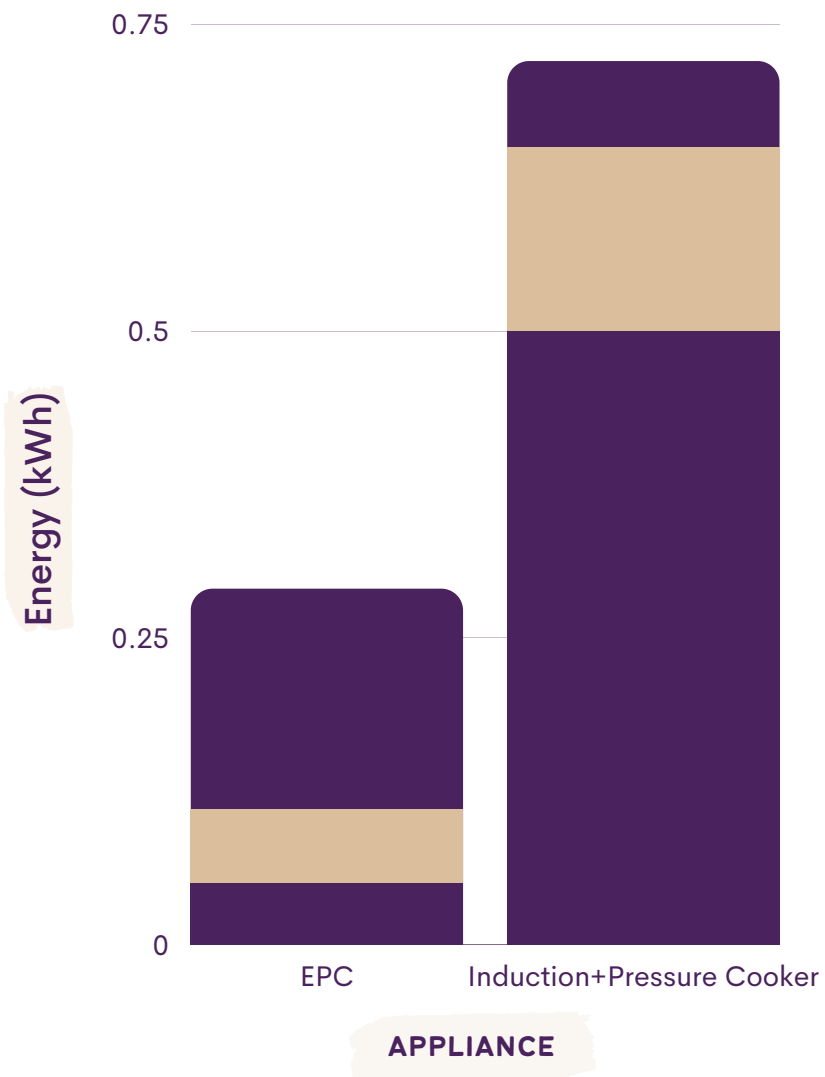
Rajma Masala

Energy Comparison

We tested cooking a Rajma Masala on an **electric pressure cooker (EPC)** and on an **induction stove with a pressure cooker**. The results showed the EPC was **more energy-efficient** and **60% cheaper** than the induction stove and pressure cooker. The induction stove, however, cooked the meal in less time than the EPC.

Device/Appliance	Time	Energy	Cost
EPC	64mins	0.29kWh	INR 1.45
Induction Stove + pressure cooker	55mins	0.72kWh	INR 3.60

60%
cheaper using an EPC



PRESSURE

SAUTE

NOTES

Rajma grains - Soft and cooked well
Gravy - Thick consistent texture
Flavors - Blended well

RICE DISHES

Rice is a staple food of India and is cooked daily in most households. It plays a crucial role in Indian cuisine and certain states in India like West Bengal, Tamil Nadu, Assam, Kerala, Bihar have a very high consumption of Rice.

Choice of cooking vessel also changes with the type of recipe being prepared and ranges from Pressure Cooker, Topes, Handis to Wok.

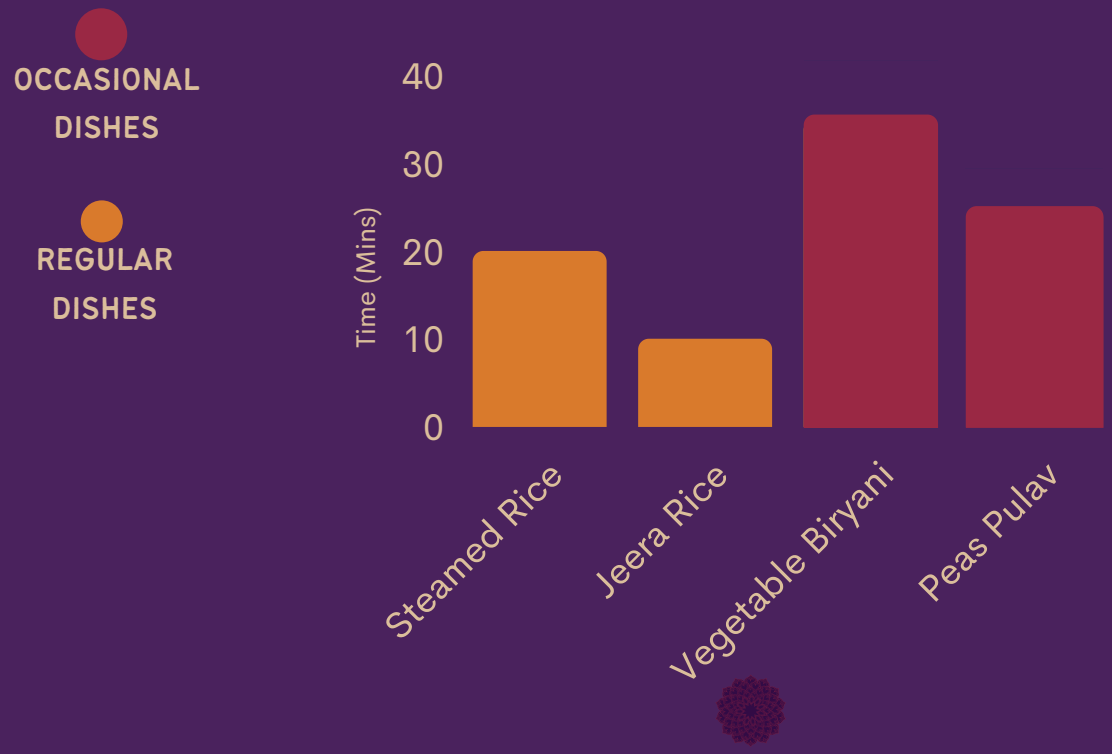
Rice in India comes in multiple varieties and differs from one region to another and so does its uses and recipes. Thus Retailers and wholesalers in India stock multiple varieties.

Choice of rice also depends on the dish that is being prepared with long grain rice also known as basmati rice is preferred when preparing delicacies like Biryani or Pulav and regular variety when being used for boiled or steamed rice dishes.

Efficiency of EPC with Rice

Time Findings

A variety of rice dishes such as steamed rice, jeera rice, Pulav and Biryani can be cooked between 10-35 minutes. Rice cooked using an EPC was fluffy and non-sticky. Even un-soaked rice can be efficiently cooked in a shorter time span.



Energy & Cost Findings

The cost of preparing rice ranged between INR 0.5- 1.1. The energy required for preparing the rice ranged between 0.10-0.22 kWh.

STEAMED RICE

INGREDIENTS

- 100 Grams Rice, soaked for 15 mins
- 300ml water
- Salt to taste

PROCESS

01 PRESSURE

PROCEDURE

Add rice to the cooker, add water (300ml). Close the lid & set to pressure cook for 20 mins in an EPC (13 mins preheating and 7 minutes pressure cook) and 12 minutes on Induction Cooktop

OBSERVATION

EPC takes more overall time than the Induction cooktop, but the actual pressure cook time is less. More time and energy consumption is required for pre-heating the device.

STEAMED RICE

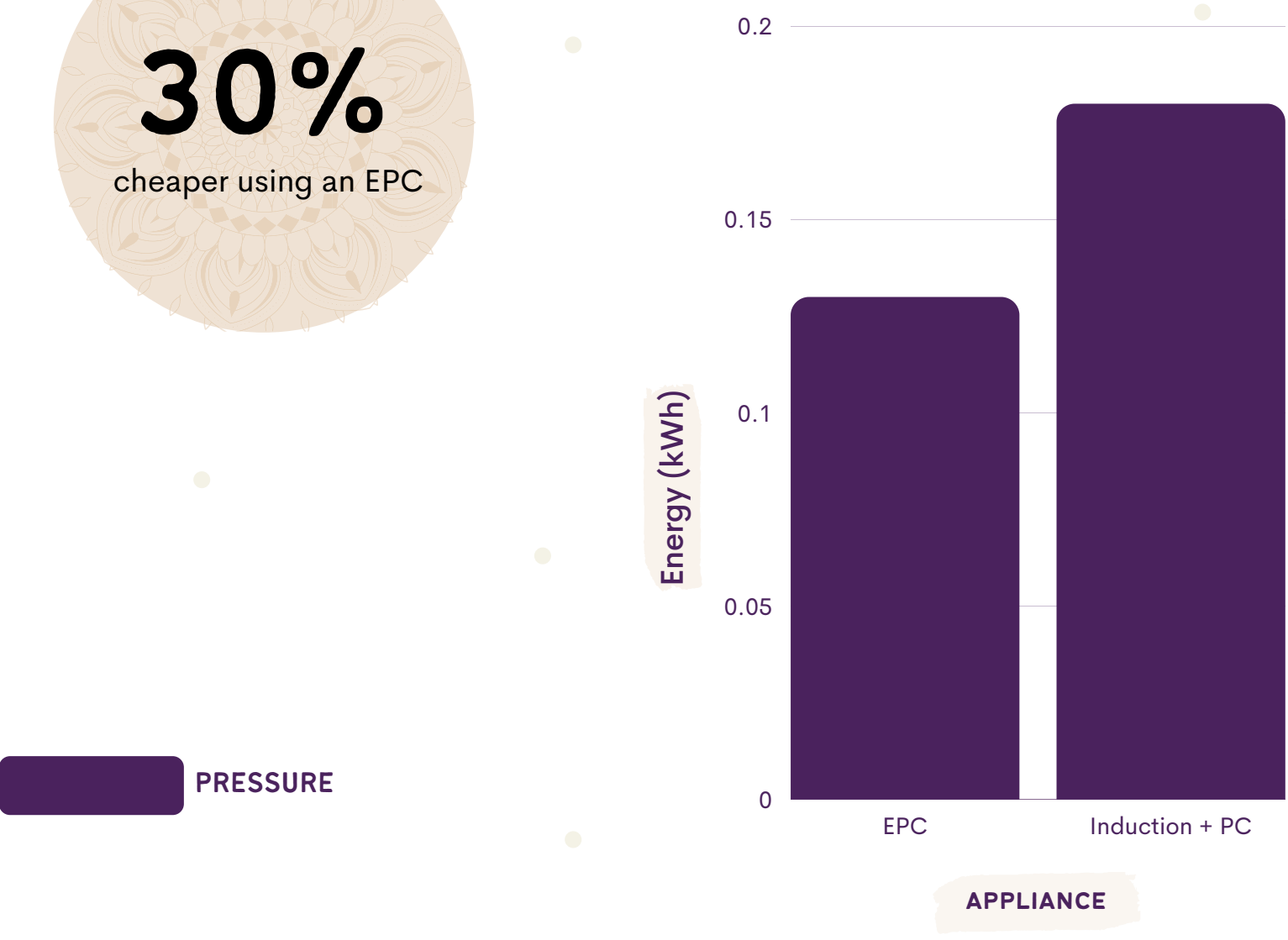
ENERGY COMPARISON

We tested cooking steamed rice on an **electric pressure cooker (EPC)** and on an **induction stove with a pressure cooker**. The results showed the EPC was **more energy-efficient** and **30% cheaper** than the induction stove and pressure cooker. The induction stove, however, cooked the meal in less time than the EPC.

Device/Appliance	Time	Energy	Cost
EPC	20 mins	0.13 kWh	INR 0.65
Induction Stove + Pressure cooker	12 mins	0.18 kWh	INR 0.90

30%

cheaper using an EPC



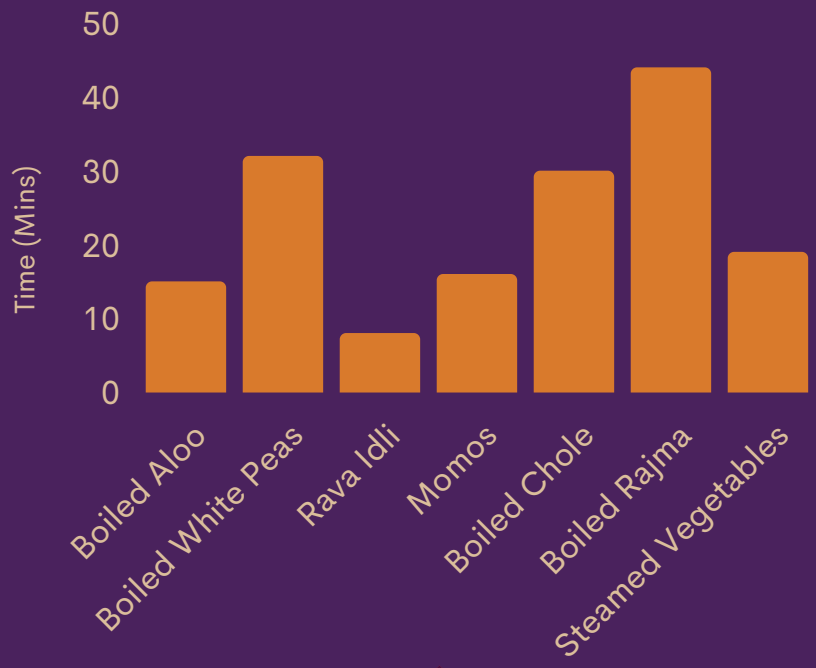
STEAMED/BOILED DISHES

- Steaming or boiling of foods is very common in an Indian Kitchen.
- Pressure Cookers, Pots, Pans with Lids, Steamers and topes are being used traditionally for steaming of food.
- Steaming or boiling process may be either used to prepare the final recipe eg Idli, Dhokla, Momos, Peetha, boiled corn, eggs, etc. or for preparing ingredients for a dishes eg Boiled vegetables, potatoes, Rajma, Chola etc

Efficiency of EPC on Steamed/Boiled Dishes

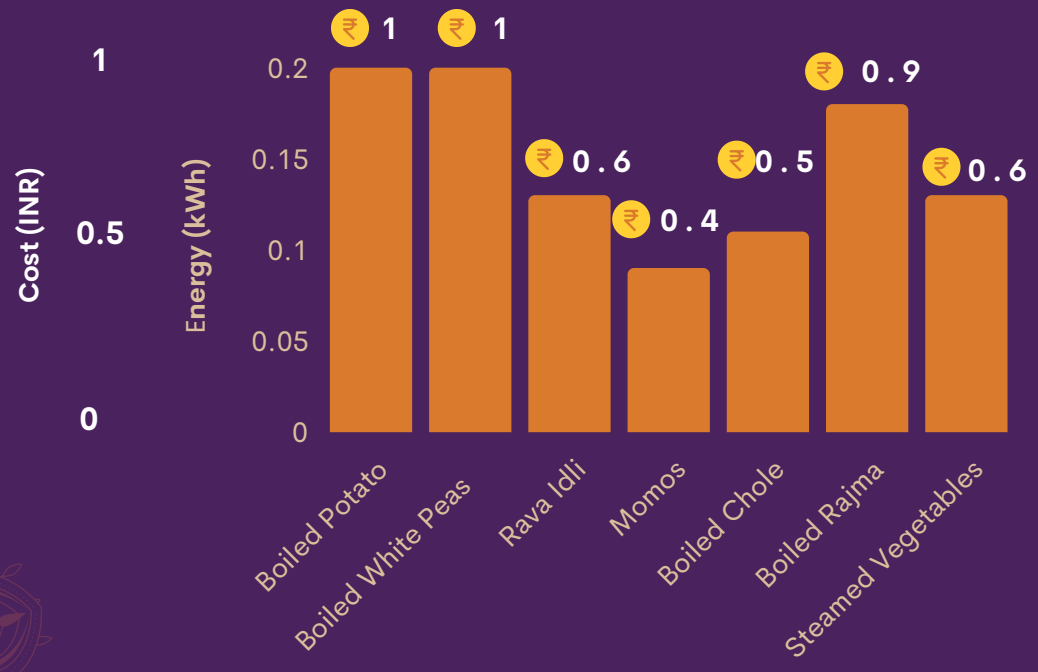
Time Findings

Fast cook dishes and vegetables can be cooked as fast as 8 to 15 minutes while boiling of raw pulses takes a bit longer i.e., 20 to 40 minutes. The actual time taken for steaming or boiling is less but pre-heating takes more time.



Energy & Cost Findings

Food can be very efficiently boiled and steamed in an EPC device. Steaming a batch of Idlis or momos can happen very efficiently at a lost cost, while the cost for boiling pulses or large quantities of vegetables can be slightly higher.



BOILED WHITE PEAS

INGREDIENTS

- 300 Grams White Peas, pre-soaked for 5 hours
- 600ml water

PROCESS

PROCEDURE

01 PRESSURE

Add 300 grams of white peas to EPC with 600 ml of water and pressure cook for 25 minutes in an EPC (7 mins preheating and 25 minutes pressure cook) and 30 minutes on Induction Cooktop

OBSERVATION

White peas cooked on EPC cooked well and the grain was soft, however, it was slightly par-cooked.

Boiled White Peas

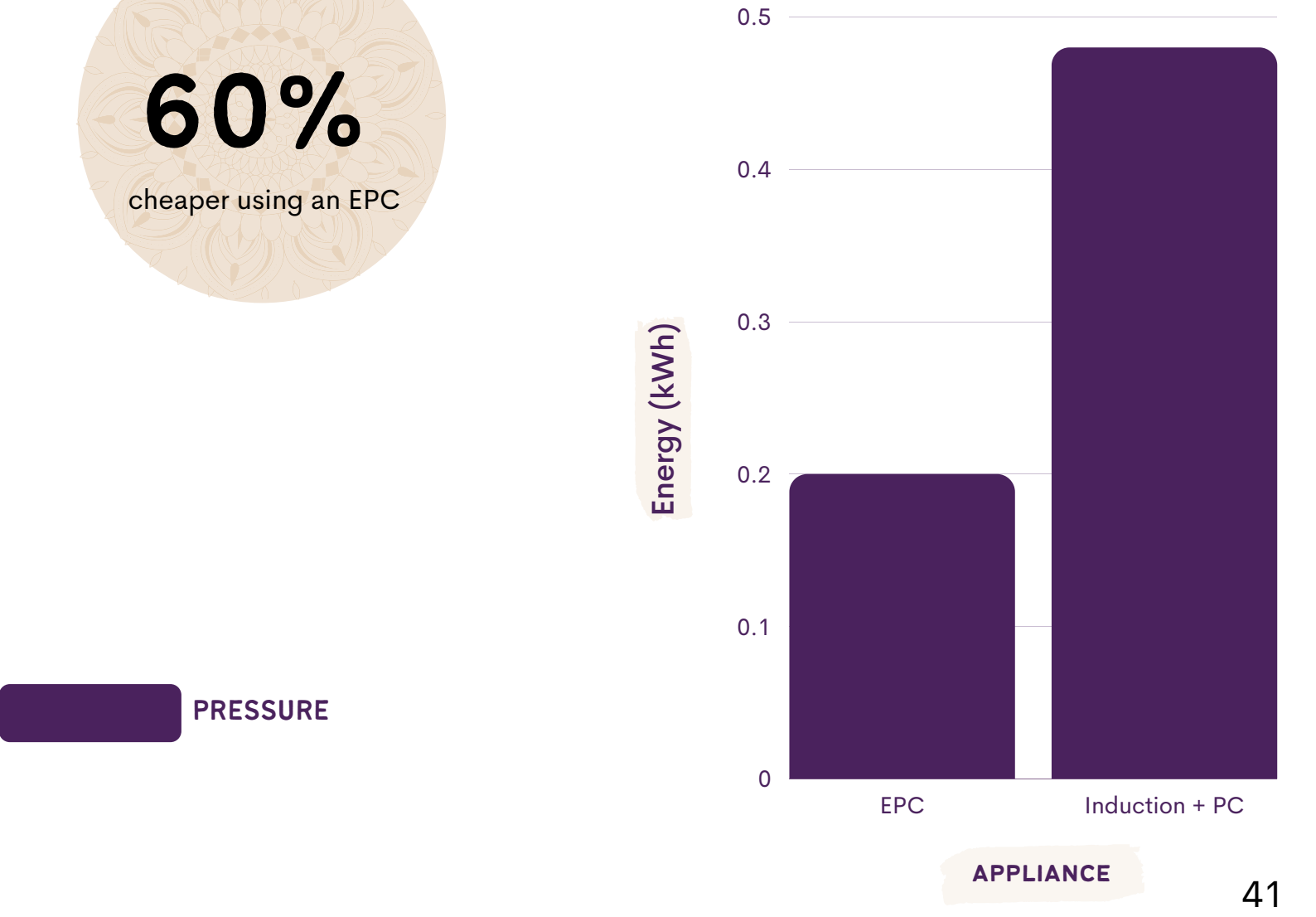
ENERGY COMPARISON

We tested cooking boiled white peas on an **electric pressure cooker (EPC)** and on an **induction stove with a pressure cooker**. The results showed the dish took the same amount of time to cook in the two devices yet the EPC was **more efficient** and over **60% cheaper** than the induction stove and pressure cooker.

Device/Appliance	Time	Energy	Cost
EPC	32 mins	0.20kWh	INR 1.0
Induction + Pressure Cooker	30 mins	0.48kWh	INR 2.4

60%

cheaper using an EPC



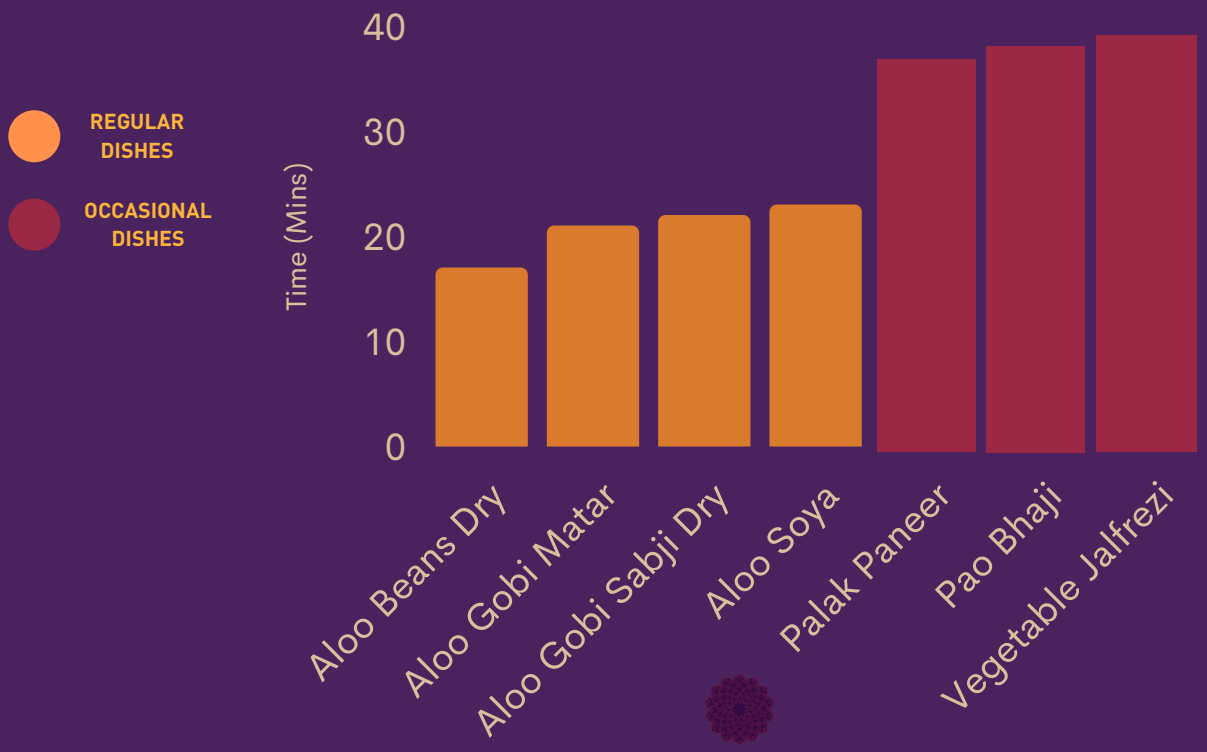
VEGETABLE DISHES

- Vegetable dishes are typically prepared once or twice a day and served with either Indian bread, dal, rice, or khichdi.
- The preparation can be dry or in gravy, the spices and, ingredients of which vary from one region to another. Choice of vegetables also differs basis regions and seasons
- Preparation involves mostly sautéing, followed by steaming or boiling the vegetables with whole and powdered spices. The gravy vegetables require the preparation of gravy and then sauteing or boiling the vegetables in that gravy.
- Typically cooked in Kadhai, thick bottom pans, tawas and in pressure cookers.

Efficiency of EPC on Vegetable Dishes

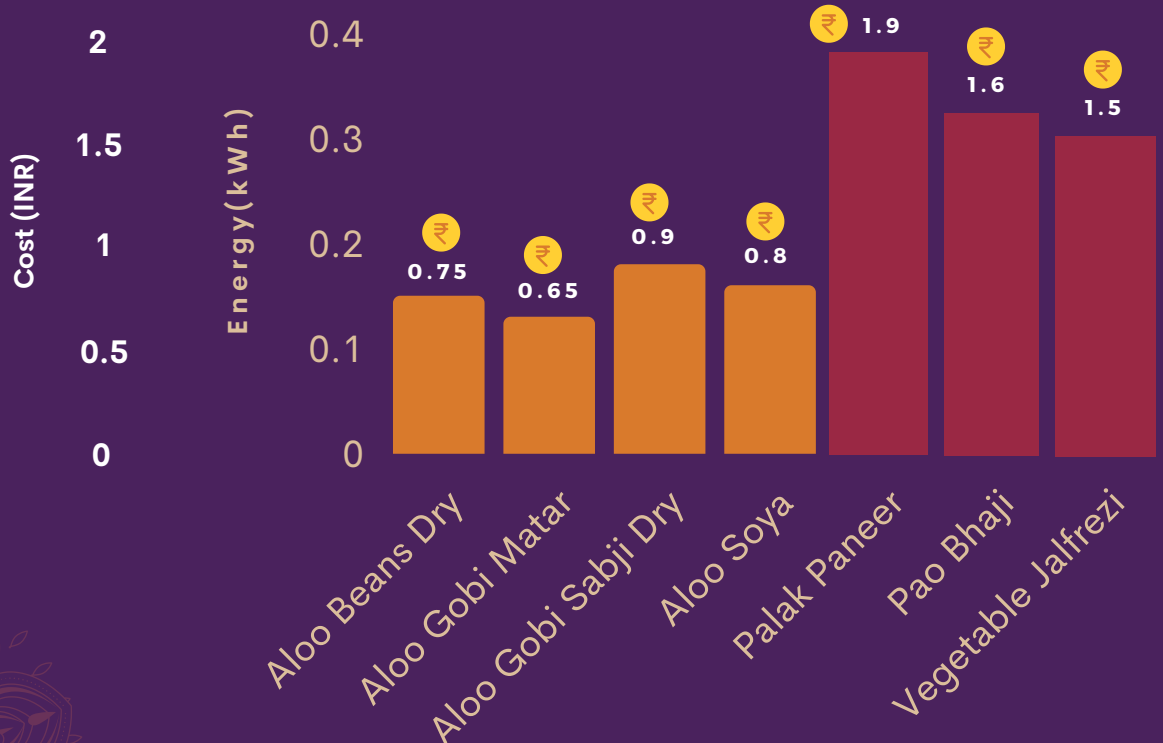
Time Findings

Regular vegetable dishes have a simple preparation process and can be cooked in a short time of 15 to 25 minutes using EPC. Occasional vegetables have a complex and time-consuming gravy preparation method and preparation time can go up to 40 to 50 minutes.



Energy & Cost Findings

Regular vegetable dishes with simple sauté and pressure cook process can be cost-effectively cooked with an EPC device at cost as low as INR 0.65, however complex vegetables require, multiple processes and more time for sauteing leading to higher costs.



ALOO BEANS DRY

INGREDIENTS

- 500 grams Aloo and Beans
- 1tsp Red Chilli Powder
- 1tsp Cumin
- 1 Onion
- 1 Tomato
- 1tsp ginger and garlic paste
- ½ tsp coriander powder
- 1tsp finely chopped green chili
- Salt to taste

PROCESS

PROCEDURE

01 SAUTE

Heat oil for 2 minutes, then add spices, onions, ginger and garlic and fry for a further 5 mins on and EPC. For Induction cooktop heat oil for 30 secs at 1300W and saute spices for 2 mins at 500W

02 SAUTE

Add beans and potatoes and saute for a further 2 minutes on an EPC. On Induction cooktop saute for 1 min at 500W

03 PRESSURE

Close lid and set pressure cooker to cook for 5 minutes in an EPC (3 mins preheating and 5 minutes pressure cook) and 5 minutes on Induction Cooktop

NOTES

- Indians mostly use a thick bottom wok for preparing vegetable dishes. We observed that vegetables can be cooked equally well with an EPC. In fact, the flavours blended better in an EPC.

Aloo Beans Dry

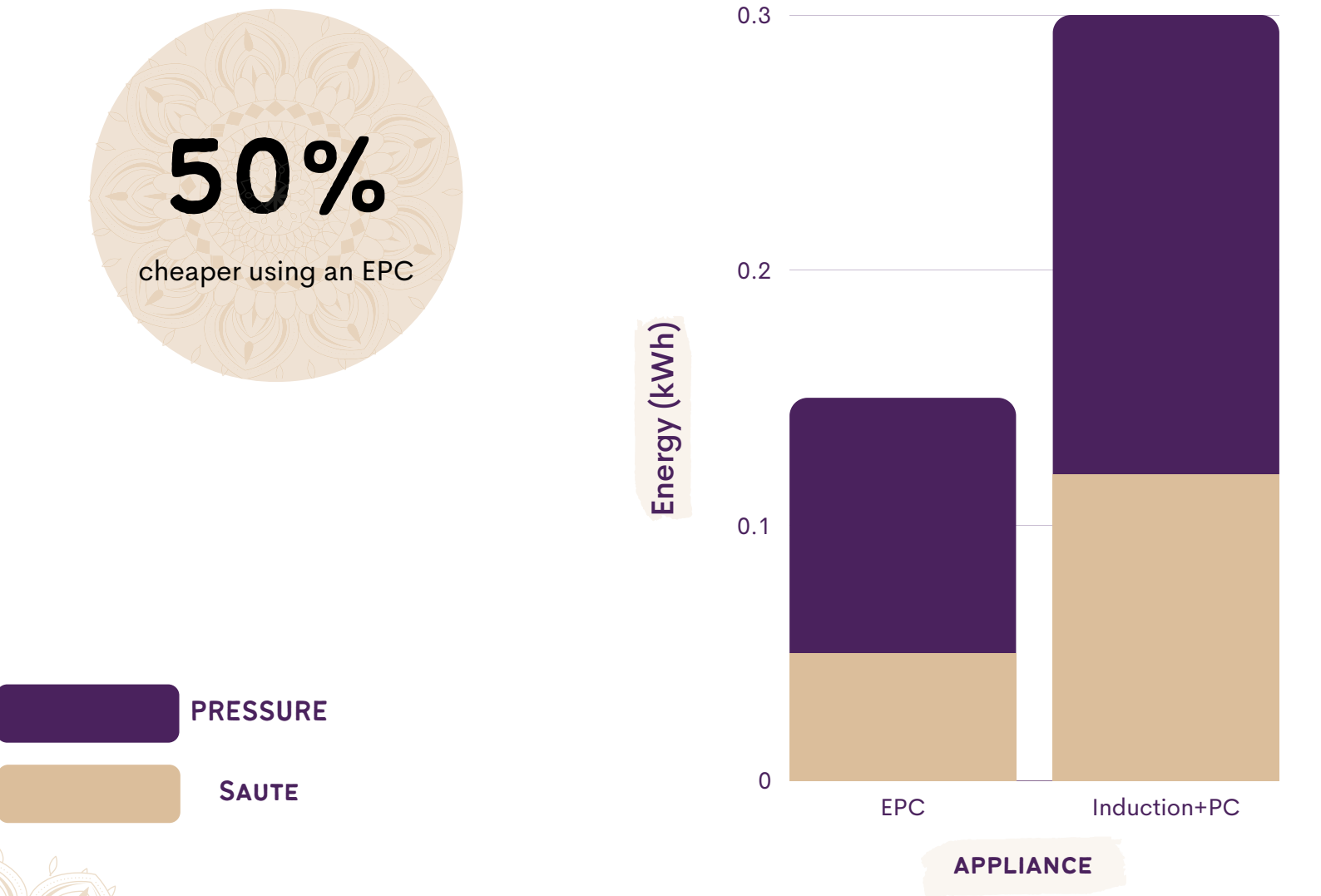
ENERGY COMPARISON

Despite taking 3 minutes longer using an EPC, the device was more energy-efficient and **50%** cheaper on our tests comparing cooking Aloo Beans on an **electric pressure cooker (EPC)** and on an **induction stove with a pressure cooker**. The EPC consumed significantly more energy during the sautéing process.

Device/Appliance	Time	Energy	Cost
EPC	17 mins	0.15 kWh	INR 0.75
Induction Stove + Pressure cooker	14 mins	0.30 kWh	INR 1.50

50%

cheaper using an EPC



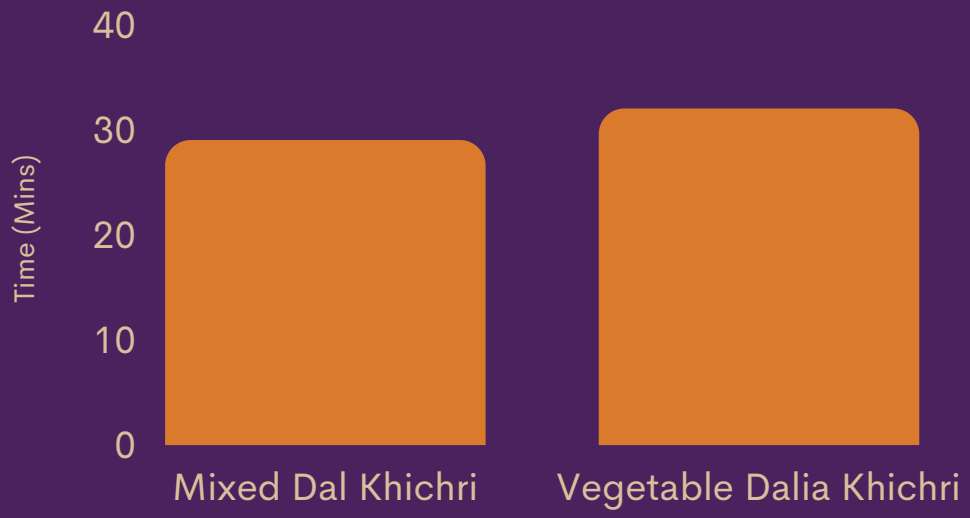
KHICHRI DISHES

- Khichri is a popular staple dish in Indian cuisine made of rice and lentils (dal). It is often prepared once or twice a week on an average.
- The choice of Dal and the seasoning changes significantly from one region to another. In some cases the rice is also replaced with other grains like daliya, bajra
- It is a meal in a whole and often consumed with either curd, pickles, chutneys or some vegetables

Efficiency of EPC on Khichri Dishes

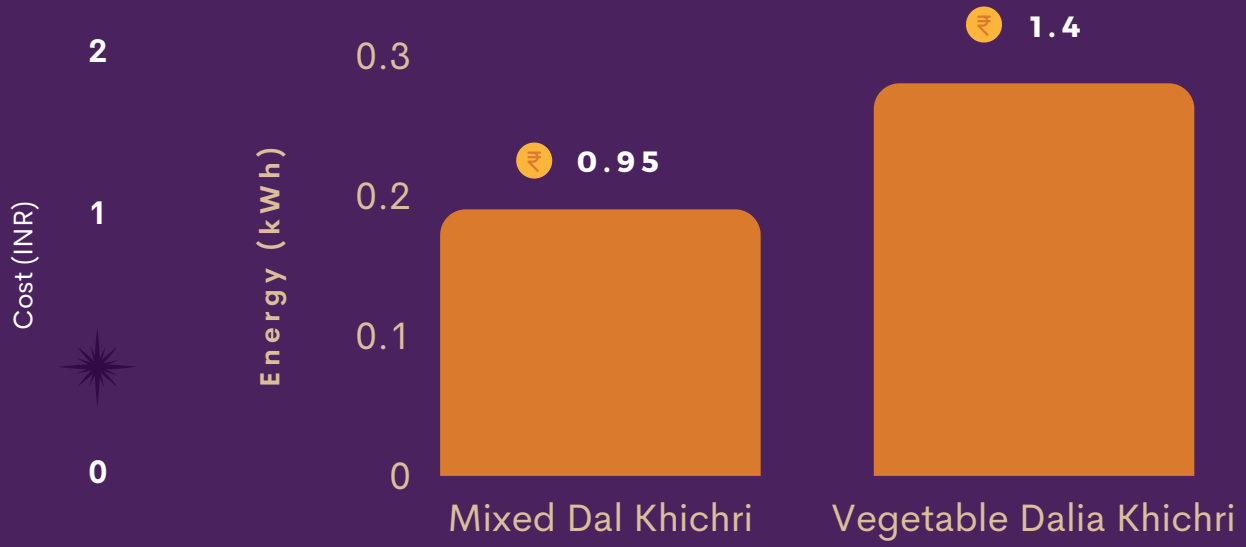
Time Findings

The perfect consistency of this wholesome meal can be achieved in a short span of 20 to 30 minutes when this meal is cooked in an EPC device.



Energy & Cost Findings

Khichri has been traditionally a slow-cooked recipe, with EPC the dish can be prepared cost-effectively in less than a rupee.



YELLOW MOONG, SPLIT MASOOR DAL & RICE KHICHRI

INGREDIENTS

- ½ bowl mixed dal
- ½ bowl rice
- 1 onion
- 1 tomato
- 1inch ginger
- 5 cloves garlic
- 1tsp cumin
- 3 chilies
- Water
- Salt to taste

PROCESS

PROCEDURE

01 SAUTE

Heat oil and fry dried spices for 3 mins, then add onions and tomatoes and fry for a further 3 mins in an EPC. For Induction cooktop heat oil for 30 sec and saute tomatoes and onions with dry spices for 2 min at 1300W.

02 SAUTE

Add dal, chawal and add water and sauté for 1 minute in an EPC. On the Induction cooktop add dal, chawal and water and sauté for 1.5 mins.

03 PRESSURE

Close lid and set pressure cooker to cook for 18 minutes in an EPC (4 mins preheating and 18 minutes pressure cook) and 8 minutes on Induction Cooktop

OBSERVATION

A thick even consistency can be achieved when cooked on EPC. Flavors get blended well.

YELLOW MOONG, SPLIT MASOOR DAL & RICE KHICHRI

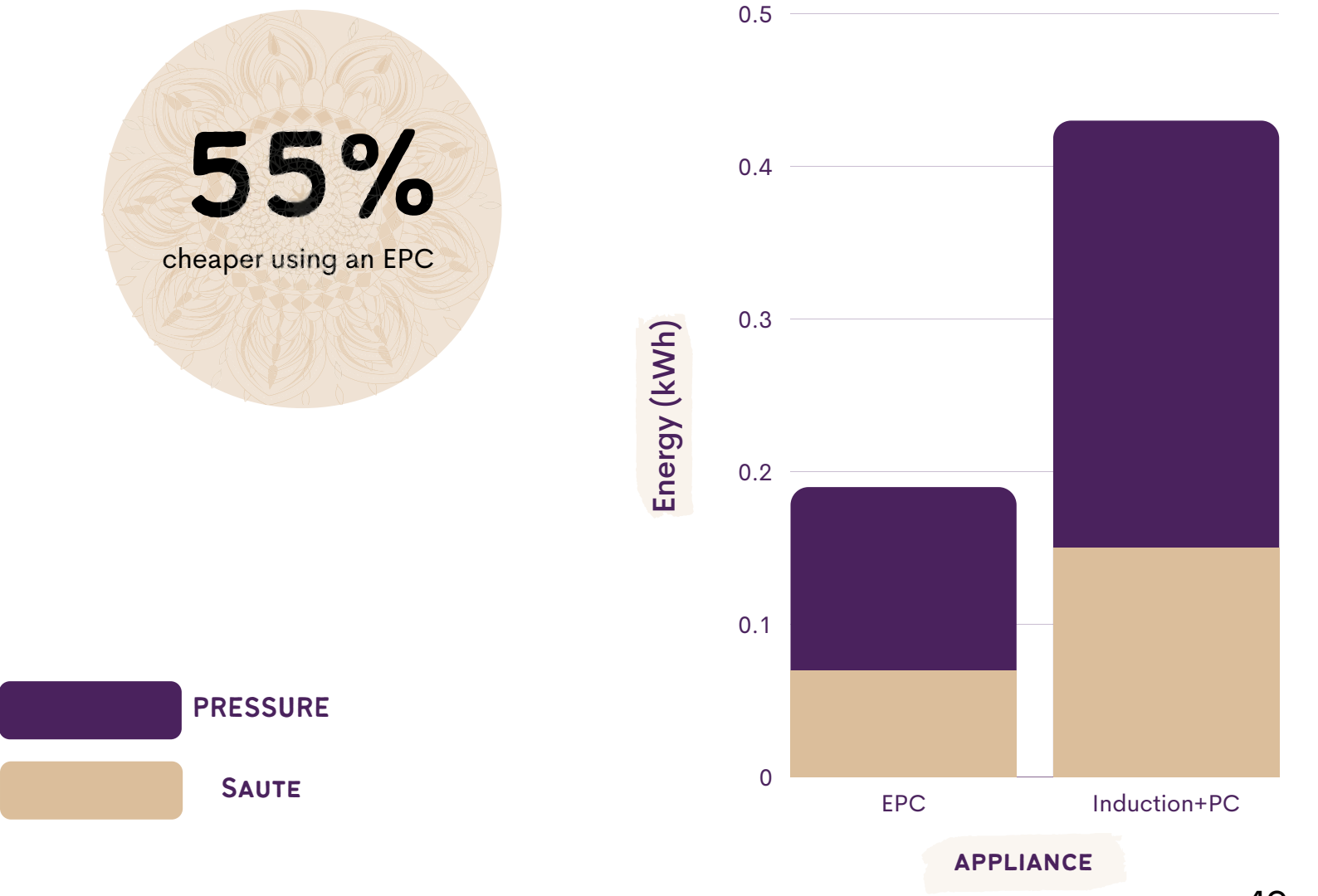
ENERGY COMPARISON

The EPC took **significantly longer** to cook this dish, however, it works out **far cheaper to prepare**. A **regular pressure cooker on the induction stove** is able to achieve higher pressure, therefore, can cook dishes faster, although it consumes far more energy.

Device/Appliance	Time	Energy	Cost
EPC	29 mins	0.19 kWh	INR 0.95
Induction Stove + Pressure Cooker	17 mins	0.43 kWh	INR 2.15

55%

cheaper using an EPC



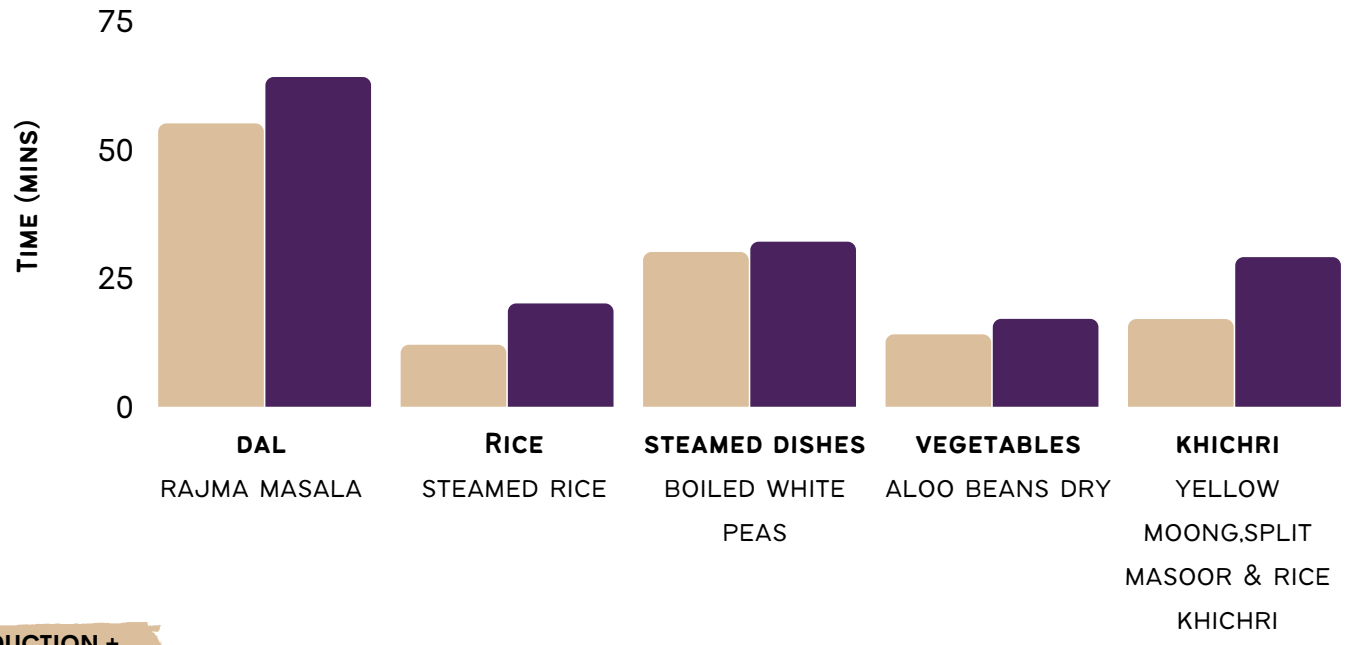
CONCLUSION

Induction vs EPC

Time

The induction stove and pressure cooker combination is quicker than the EPC because:

- the induction stove has a **higher power rating** than the EPC, so it's able to bring the contents of the pot above boiling point more quickly
- a stove-top pressure cooker has a **higher operating pressure** than an EPC, so it cooks faster.

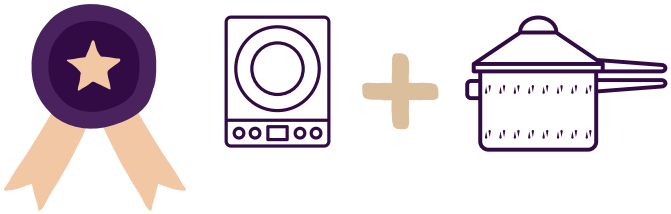


INDUCTION + PRESSURE COOKER

EPC

Best performer

INDUCTION + PRESURE COOKER



25%

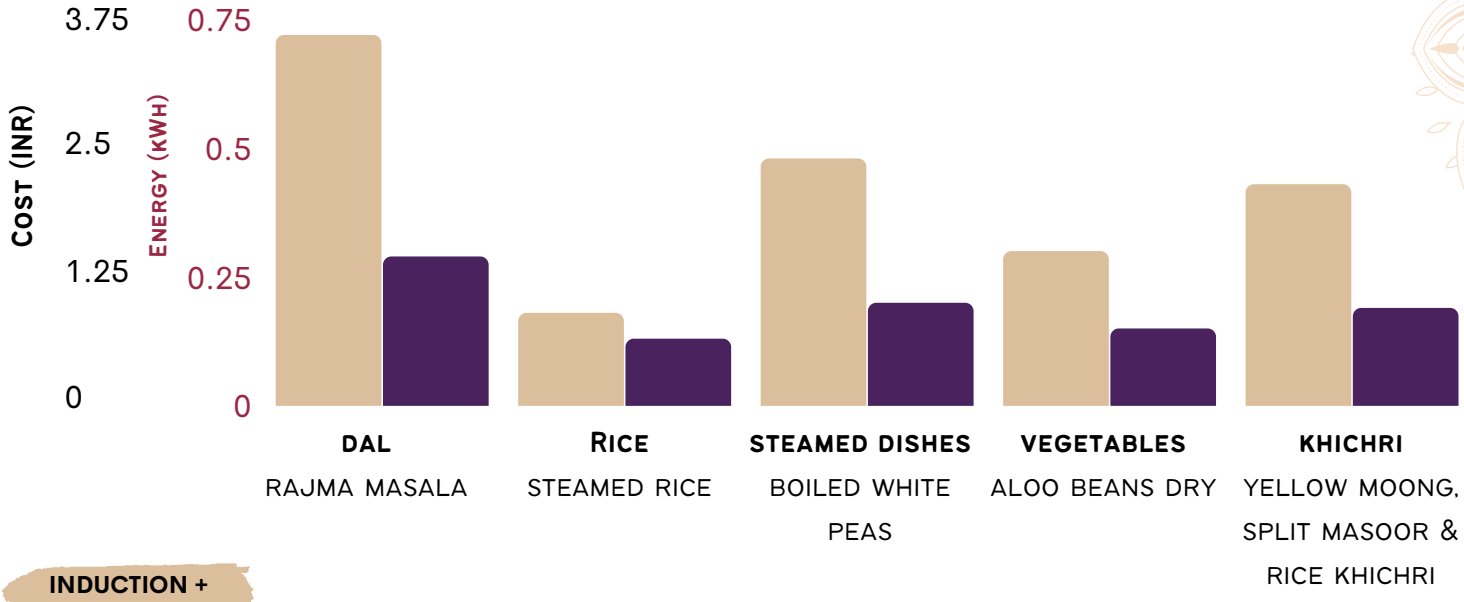
Average time saving with induction + PC

Induction vs EPC

Energy & Cost

The EPC is more energy-efficient and therefore more cost-effective than the induction stove and pressure cooker combination for the dish types we tested because:

- the EPC is insulated, so **less heat escapes**
- the EPC is **fully automated**, so it turns the heating element off as soon as it reaches pressure



Best performer

EPC

50%

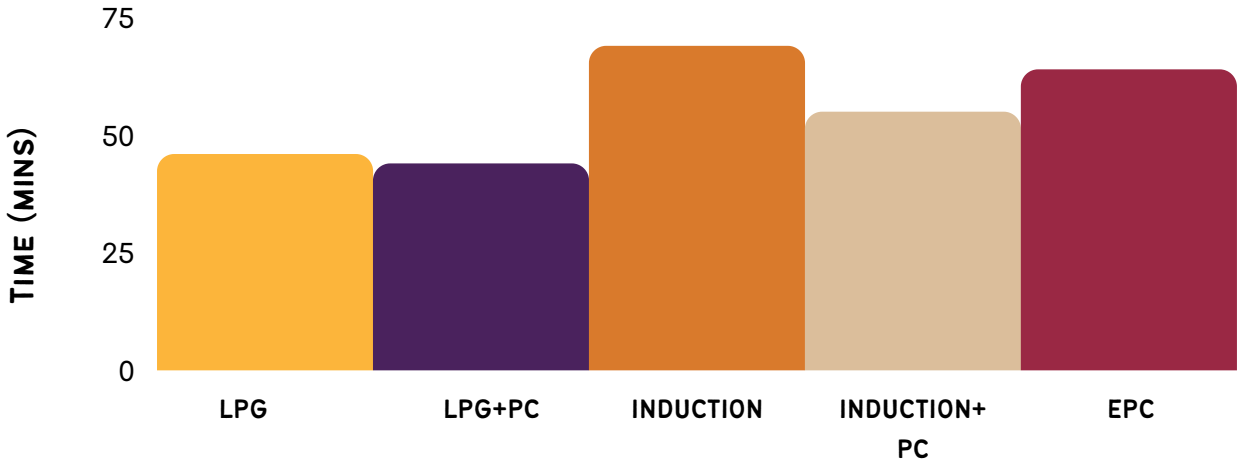
Average cost saving with EPC

Time - Rajma Masala

We compared the cooking time and cost for LPG, induction, and the EPC. The specific results for Rajma Masala are presented below, however, the other dish types are shown previously follow similar trends.

The results show that LPG is the fastest way to cook. Using a pressure cooker can further reduce cooking times, but only by a small amount. The induction stove with an unpressurised pot is the slowest way to cook, however, using a pressure cooker makes induction faster than the EPC. The LPG and pressure cooker combination is quickest because:

- it has **higher firepower** than either induction or the EPC, so it is able to bring the contents of the pot above boiling point more quickly
- a stove-top pressure cooker has a **higher operating pressure** than an EPC, so it cooks faster.



Best performer

LPG +pressure cooker

14%

Average time saving with presure cooker for either induction or LPG

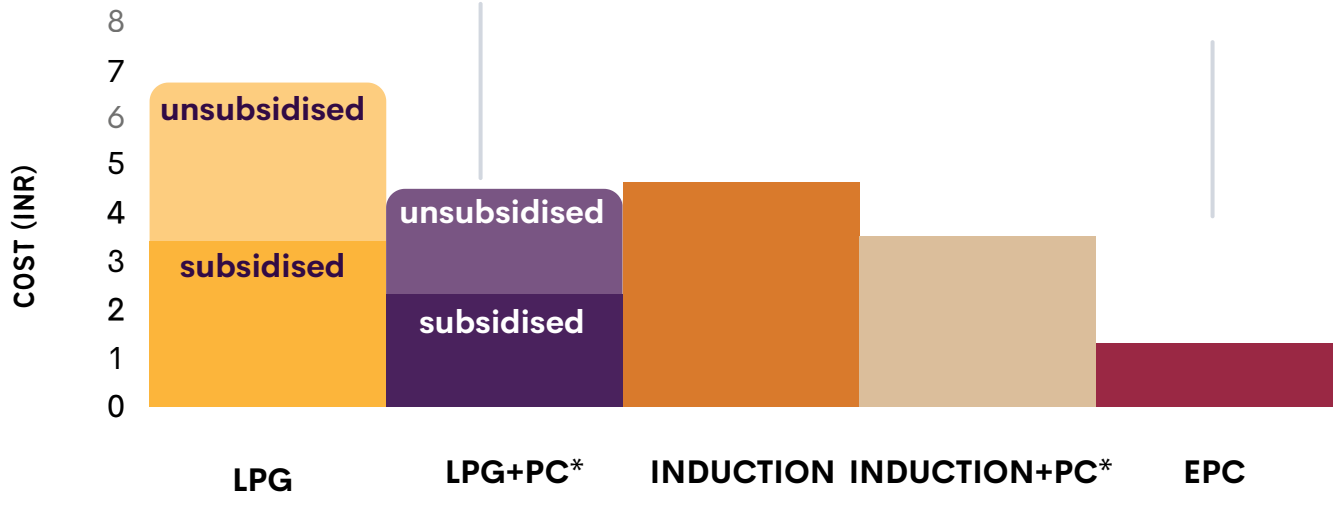
Cost & Energy - Rajma Masala

The EPC is the cheapest way to cook Rajma Masala. Unsubsidised LPG is the most expensive, however, using a pressure cooker can reduce the cost by around 25%. Induction is approximately 25% cheaper than LPG and similar savings are possible with the pressure cooker. Subsidised LPG is cheaper than induction, however, the EPC is the most energy-efficient and therefore more cost-effective because:

- the EPC is insulated so less heat escapes
- the EPC is fully automated, so it turns the heating element off as soon as it reaches pressure

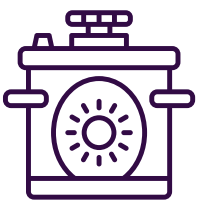
40%

Cost saving with EPC vs LPG with pressure cooker



Best performer

EPC



60%

Cost saving with EPC vs induction with pressure cooker

*PC = Pressure Cooker

Conclusion

The Kitchen Laboratory experiments in this eCookBook have shown that:

COST-SAVINGS

Indian households could make substantial cost savings on dishes that require pressure cooking, steaming, or boiling (~50%) by complementing their induction stoves or LPG with an EPC

MODERN ALTERNATIVE

An EPC offers a modern alternative to the pressure cooker, saucepan, kadhai, idli maker, rice cooker, wok, etc. It is capable of cooking most (~85%) of a typical Indian weekly menu and is likely to be the first choice for almost half (~48%) of the menu

CONVENIENCE

Using a conventional pressure cooker with an induction stove or LPG is slightly faster (~30%), however, the EPC is more convenient as it has multiple preset menus & is fully automated so can be left unattended, allowing the cook to multi-task

- The **texture** of cooked dal was better in an EPC than induction + conventional pressure cooker.

- The **flavors** blended better in an EPC versus induction + conventional pressure cooker.

The evidence in this eCookBook shows that an EPC can be a valuable complement to an induction stove, as each has its own strengths and weaknesses. An EPC can very efficiently replace the conventional pressure cookers, Idli makers, steamers, and rice cookers 100% and other utensils partially, and thus, it is likely to be a valuable tool for the electrification of Indian kitchens.