ECO: FINAL REPORT

Analysis of the Key Findings from the Electric Cooking Outreach (ECO) Challenge Fund Projects

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MECS Modern Energy Cooking Services

Image credit: PEEDA, 2021

Loughborough University

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This report draws together the findings of the MECS Electric Cooking Outreach (ECO) challenge fund. The projects focused on the distribution, wider use, and monitoring of efficient electric cooking appliances along with the broader market opportunities for electric cooking. The results were highly encouraging, with rapid, significant and sustained electric cooking uptake shown in the pilot studies undertaken and with clear market opportunities identified. **The analysis furthers the MECS evidence base by demonstrating that not only are efficient electric cooking appliances compatible with local menus, but that households are also willing to use and pay for electric cooking in a wide range of contexts.**

EXECUTIVE SUMMARY

Through seven community scale 6-month pilot studies and one market assessment, the ECO Challenge fund assessed and compared the compatibility, uptake and broader market opportunities for energy efficient electric cooking appliances (EECAs) in different socio-economic and cultural contexts in Africa and Asia. The overall aim was to provide an evidence base to inform policymakers, investors and other key actors of the current opportunities to scale up electric cooking (eCooking), de-risk policy making and investment, and accelerate the transition away from the harmful impacts of cooking with solid fuels such as wood and charcoal. Key findings were:

- **eCooking uptake was swift, significant and sustained in each pilot study**. On average, the percentage of dishes cooked with electricity increased from 7% in month 1 (baseline) to 38% in month 6, highlighting how electric cooking can fit the cultural cooking practices and the electricity supply in a wide range of contexts (Figure 1).
- Unlike other MECS pilot and research studies, households were not asked to cook on electricity and could use their EECAs as much or as little as they wished. This more real-life scenario significantly advances the case for electric cooking at scale **by showing that people are willing to use and pay for electric cooking on a sustained basis.**
- Uptake of EECAs led to large falls in cooking with fossil fuels and biomass, showing how eCooking can reduce greenhouse gas emissions, contribute to national climate change targets and offer major health, social, economic, and environmental benefits.
- Cooking the local menu on EECAs resulted in large fuel cost savings in all pilots.
- In all pilot studies, eCooking coincided with existing morning and evening peak demand for electricity, suggesting scaled uptake could potentially cause problems if not coordinated with grid and off-grid electricity infrastructure strengthening. However, the studies highlight how EECAs, especially highly efficient EPCs that draw far less power than induction stoves, can mitigate the impact on loads for grid and off-grid systems.
- Potential exists to expand eCooking. In the studies, almost all households used only one EECA, and most households showed a demand for a second unit. Most households wanted to cook dishes simultaneously, suggesting those with two EECAs would likely cook most of their food on electricity.
- Iterative adjustments to the marketing mix proved effective in increasing sales of EECAs in Cambodia, with reduced monthly payments and free trials having most impact. This is reflective of the price sensitivity of participants in the other ECO studies.
- The Nepal market assessment found the current and near future opportunities for eCooking to be highly promising due to increasing domestic hydropower production, rising consumer demand, and a supportive national policy framework.

ECOOKING UPTAKE WAS SIGNIFICANT AND SUSTAINED IN ALL PILOT STUDY LOCATIONS

Image credit: Bansod, 2021

CALL FOR ACTION

The uptake of EECAs in each pilot along with the clear opportunities to scale shown in the market assessment, provide an evidence base which serves as an intermediary step towards larger scale up. In particular:

- The sustained usage and market opportunities highlighted in this report serve as a call for government and non-government institutions to be far more dynamic in advocating for and scaling electric cooking.
- By demonstrating that people will use and pay for eCooking, the ECO pilot studies highlight the clear opportunities for organisations (both state and private sector) to start selling EECAs or expand their operations and place far larger orders of EECAs.
- Likewise, the sustained use of EECAs facilitates novel financing forms such as results-based financing or carbon financing, which could make eCooking an even more attractive proposition.

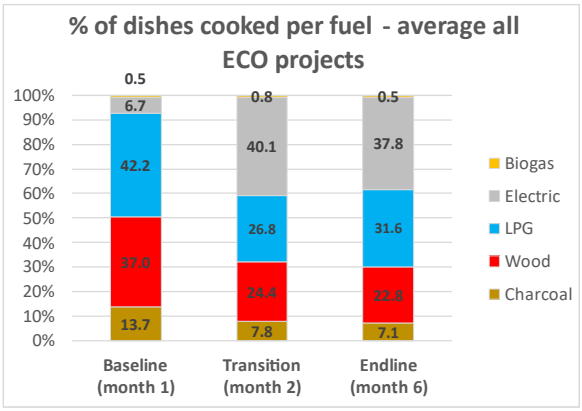


Figure 1. eCooker use was significant and sustained across all projects*. The percentage of dishes cooked with electricity increased from 7% to 38% between the baseline (month 1) and endline (month 6). *Figure does not include data from the iDE ECO project which centred on marketing strategies.

PEOPLE WERE WILLING TO USE AND PAY FOR ELECTRIC COOKING ON A REGULAR BASIS.

INTRODUCTION

Launched in 2019, the Electric Cooking Outreach (ECO) challenge fund focused on the distribution, wider use, and monitoring of efficient electric cooking appliances along with the broader market opportunities for electric cooking. The overall aim was to provide an evidence base to inform policymakers, investors and other key actors of the current opportunities to scale up electric cooking and de-risk policy making and investment. There were two themes under the call:

Theme 1: Community scale pilot studies. Focus on monitoring whether efficient electric cooking appliances fit the cooking cultures and electricity supply in different communities.

Theme 2: Markets assessments. Gather market intelligence on the opportunities emerging for efficient electric cooking appliances in FCDO priority countries.

The theme 1 pilots were at a larger scale than previous MECS studies, with a greater focus on consumer behaviour than previous MECS pilots. Previous pilots had primarily been concerned with how much of a certain cuisine could be cooked on eCooking devices. The ECO projects were intended to build on these early studies which had demonstrated eCooking was compatible in the country contexts. They had explored how cooks might choose to use EECAs if made available and whether they might be willing to use and pay for eCooking on a sustained basis. Undertaking more behavioural focussed studies with larger samples was seen as key to demonstrating to government and non-government actors the scale of the current demand for eCooking and that the time was right for more dynamic advocacy, investment and scaling of eCooking.

Together, the two ECO themes serve core objectives at the heart of the MECS programme; facilitating the planning and implementation of national planned policies and programs to increase access to modern energy cooking services.

Image credit: IRADe, 2021

LOCATIONS

14 projects (13 pilot studies and 1 market assessment) in nine countries in Africa and Asia were funded under the call (Figure 2). The geographical spread addressed the typical case study selection issues of "balancing depth…with breadth - producing conclusions sufficiently generalizable" (Sovacool, 2014, p.11). The wide range of locations featuring varied cultural cooking practices addresses breadth while depth was achieved by the selection of multiple projects in Kenya and in particular Nepal.

Both Kenya and Nepal have excess capacity on their national grids which could accommodate increased uptake of eCooking devices and both have governments who view eCooking as an important means to provide additional loads for this surplus supply. There is also a large body of existing, ongoing, and planned research, policy and initiatives in both countries, which ECO and its findings on the scope for scaled uptake was well placed to support. Ultimately the higher quality of Nepal based ECO applications together with the significant levels of government support for electric cooking resulted in a larger number of projects being funded by Nepal.

Table 1. ECO projects by type and location

Community pilot study locations	Market assessment locations
Bangladesh	Nepal
Cambodia	
Kenya (2.5)	
Myanmar	
Nepal (4)	
Tanzania	
Uganda (0.5)	

This report documents the findings from the eight ECO projects completed at the time of writing. A further four ECO pilot studies are to be completed this year: two located in Kenya, one part located in both Uganda and Kenya, and another in Bangladesh. A further two pilot studies (in Rwanda and Zambia) were cancelled in 2021 due to changes in the MECS spending profile.

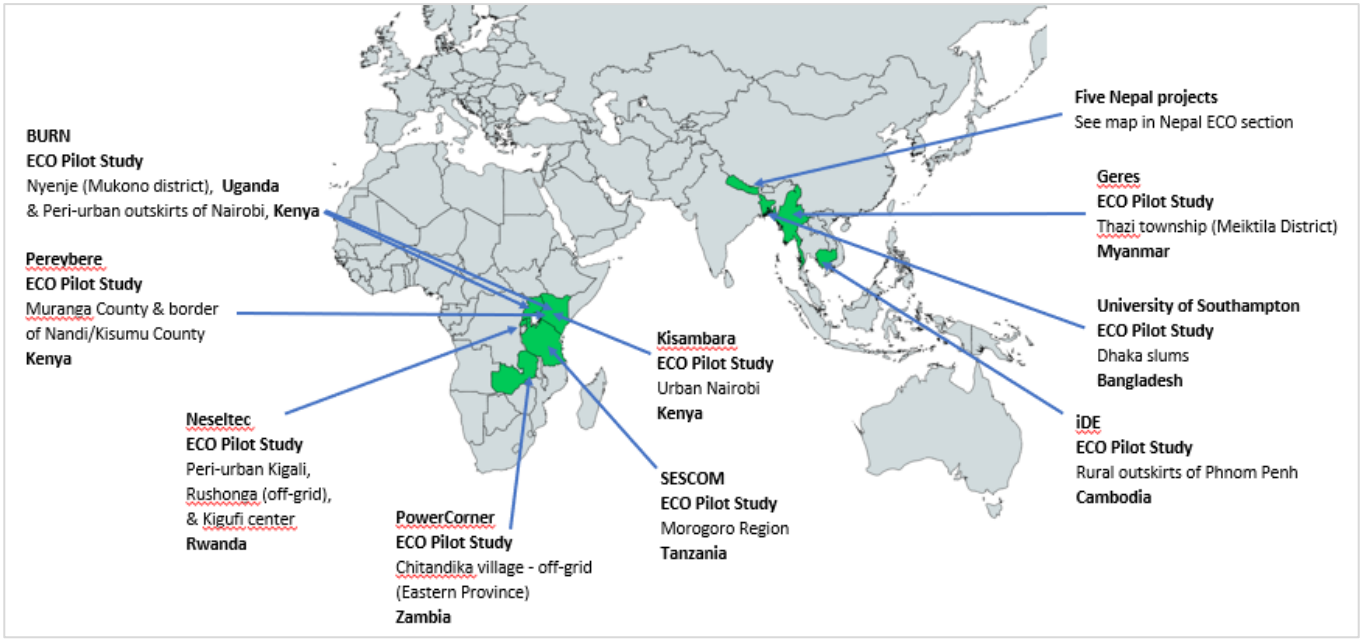


Figure 2: ECO project locations

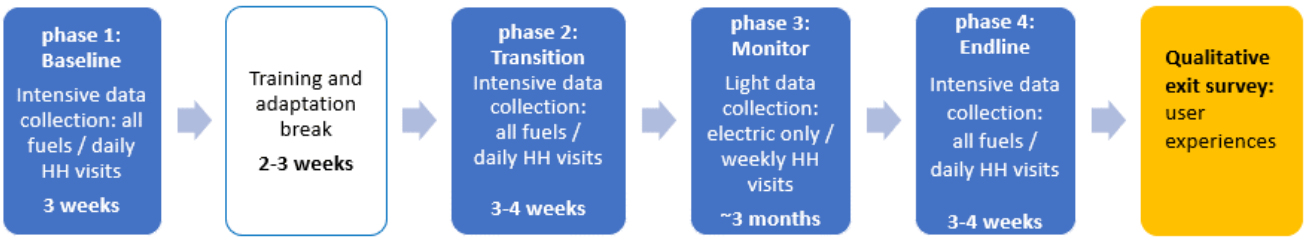


Figure 3. Phases of an ECO Cooking Diaries study

COOKING DIARIES APPROACH:

The MECS Cooking Diaries approach was recommended to all ECO theme 1 awardees as a tried and tested method to deliver the data required from the pilot studies. Projects using the same methodology would also help generate more comparable data, creating a stronger evidence base for informing policy. The approach is a mixed quantitative and qualitative method which involves recording energy measurements of the cooking fuels used and matching these recordings with diary data, where participants note down information such as what dishes they cooked, how, when, and for how many people.

At its core, the methodology is a 'before and after' approach. A baseline cooking diary and energy measurements (phase 1) are first carried out to establish existing cooking practices before being compared with how people cook after EECAs are introduced from phase 2 onward. Comparing the number of dishes cooked with each fuel in different phases allows the scale of eCooking uptake to be assessed and to understand which fuels are being replaced by electricity and for which dishes. Additional qualitative feedback on participants' experiences of eCooking is captured via exit surveys, typically conducted at the end of the pilot.

ECO COOKING DIARIES

The cooking diaries approach used in the ECO pilots differed from those used in previous MECS studies due to core differences in the setup and aims. The ECO pilots were far larger than previous MECS cooking diaries studies, with between 45-160 participants whereas earlier studies typically had 10-20 participants. The ECO pilots were also far longer than previous studies (six months rather than two) as the aim of the pilots was to understand consumer behaviour not menu compatibility; the rationale being you need time to make reliable assessments about behaviour change, seasonal trends, and evolving cooking practices.

Therefore, given the core focus on understanding behaviour and the willingness of people to use and pay for eCooking, participants were not asked to cook as much as possible on electricity (as with previous menu compatibility studies) but were free to cook using whichever fuels/appliances they wished. This type of cooking diaries study is therefore a more 'real-life' test of eCooking uptake. However, projects could reduce some of the potential barriers to switching through activities such as appliance training and awareness raising. Being outreach projects, many ECO studies also incorporated other dimensions such as product testing, marketing strategies, and willingness to pay

To make these longer and larger studies less arduous for researchers and participants, a third phase was added which used the cooking diaries light approach where only cooking on EECAs was monitored (Figure 3). Most projects also used digital data collection platforms while some had dataloggers which helped in terms of verifying and processing the greater quantities of data and ensuring quality control. Incentives were also important to keep participants motivated to complete their diaries. Examples included discounted or free eCooking appliances on satisfactory completion of the study and more regular incentives such as provision of household goods that didn't affect menu choice (e.g., soap but not food/money).

Figure 4. ECO webinar 3 (Image credit: MECS 2020)

ECO WEBINARS

To assist ECO awardees (and others considering cooking diaries studies), a four-part webinar series on how to carry out a Cooking Diaries study was developed and delivered in 2020. Focussing on themes such as setting up, data collection, and data verification and analysis, the webinars served as a reference point and facilitated more consistent and comparable data collection and analysis processes, enabling a broader evidence base to be built.

ADAPTATIONS

Several awardees innovated methodologically, adapting the ECO cooking diaries to enable varied and multiple focuses and to suit specific project needs. For their phase 2, Practical Action Consulting (PAC) subsidised electricity costs, asking participants to cook as much as possible on electricity. Phase 3 and 4 then returned to the standard ECO approach, with no subsidies and participants left to use the EECAs as much or as little as they wished. Comparison of eCooking uptake in phases 2-4 provided insights on the impacts of tariff variations (a key policy issue for the Government of Nepal) and the extent to which a full switch to eCooking might be possible.

Other awardees adapted by running 'parallel cooking diaries' in which some households used the standard ECO approach while a larger group used the cooking diaries light (i.e., phase 3 only). Although not as comprehensive as using the standard approach for all households, the approach was less resource intensive and enabled larger sample sizes (e.g., PEEDA's 160 household outreach), with the cooking diaries light households serving to scale up the findings of the smaller standard methodology group.

iDE reported that for their primarily market-based project, the cooking diaries approach was "not a good fit as it is challenging to create a uniform control group with customers". Instead, iDE's approach centred on making iterative changes to marketing strategies to see which most impacted EECA sales. A sample group of customers was monitored to assess how appliances were used.

Ultimately, the choice of cooking diaries approach will depend on the broader aims the data serves and factors such as available resources. The adaptations made by the ECO projects are important methodological developments as they illustrate how future cooking diaries studies might have larger sample sizes and multiple focuses.

COVID-19 IMPACTS

COVID-19 and accompanying in-country lockdown measures impacted and significantly delayed all ECO projects (most by over 6 months), which, being outreach studies, were highly dependent on community interactions. To mitigate impact, many projects developed methodological workarounds such as conducting activities (where possible) online or by phone, reducing the frequency of household visits, and leveraging the easier travel options and greater community trust of local project partners to carry out project activities within the communities.

The impact of COVID 19 on cooking practices was varied across the six projects that directly reported on this theme. Most noted the price of staple foods had increased but that this had not significantly affected cooking practices. PAC and iDE saw preferences for eCooking increase as unlike other fuels no travel was required to purchase electricity. In Nepal, the large government discounts on electricity bills during lockdowns likely further incentivised eCooking. The economic downturn saw some of iDE's customers turn more to free firewood or old stocks of fossil fuels to save on electricity bills.

METHOD EVALUATION

Participant fatigue from the longer ECO cooking diaries was widely reported and understandable, particularly given the impacts of the pandemic. However, the broad consensus from awardees was that the ECO cooking diaries approach, while demanding, provided very rich, valuable data. The Geres team stressed “the way we conducted the project and the huge amount of data we collected… I think it’s the right way to get the real situation in the field”, while the PEEDA/University of Bristol team similarly enthused “The amount of data is so rich. We will be hiring a researcher after the project is finished just to dig into the ECO data more”. Going forward, the adaptations and processes adopted by the ECO awardees provide vital learnings which can faciliate future cooking diaries

INDIVIDUAL PROJECT FINDINGS & ACKNOWLEDGEMENTS

The next section presents in more detail the key findings from the eight completed ECO projects. The findings presented were adapted from blogs co-created by MECS and ECO awardees to promote the final reports for each project. In the case of Practical Action Nepal, the findings summarise the market assessment and accompanying policy brief developed by the Practical Action team.

The contributors to the initial blogs are acknowledged below, with projects listed in the order they appear in this report. The blogs can be accessed from the MECS website

- **SESCOM: Tanzania Pilot Study**
  Megan Bomba (Nexleaf Analytics), Chelestino Balama (TAFORI), Mary Swai (SESCOM), Richard Sieff (MECS), and Eric Wright (Nexleaf Analytics).

- **Geres: Myanmar Pilot Study**
  Alexis Caujolle (Geres) and Richard Sieff (MECS).

- **iDE: Cambodia Pilot Study**
  Richard Sieff (MECS) & Amey Bansod (iDE).

- **Practical Action Nepal: Nepal Market Assessment**
  Richard Sieff (MECS), Pooja Sharma (Practical Action), and Min Bikram Malla (Practical Action Nepal).

- **IRADe: Nepal Pilot Study**
  Richard Sieff (MECS), Dr. Ashutosh Sharma (IRADe), Saumya Vaish (IRADe), and Dr. Chandrashekhar Singh (IRADe).

- **PEEDA: Nepal Pilot Study**
  Richard Sieff (Loughborough University), Biraj Gautam (PEEDA), Sam Williamson (University of Bristol), and Will Clements (University of Bristol).

- **Practical Action Consulting: Nepal Pilot Study**
  Richard Sieff (MECS), Pooja Sharma (Practical Action), Dr. Ashma Vaidya (Ajummery Bikas Foundation), Shekhar Sharma (Ajummery Bikas Foundation Ajummery Bikas Foundation), and Mahendra Chudal (National Association of Community Electricity Users Nepal).

- **Winrock International: Nepal Pilot Study**
  Richard Sieff (MECS), Govinda Khanal (Winrock International) and Rabin Shrestha (Winrock International).

“THE WAY WE CONDUCTED THE PROJECT AND THE HUGE AMOUNT OF DATA WE COLLECTED… I THINK IT’S THE RIGHT WAY TO GET THE REAL SITUATION IN THE FIELD”

Image credit: PEEDA, 2021

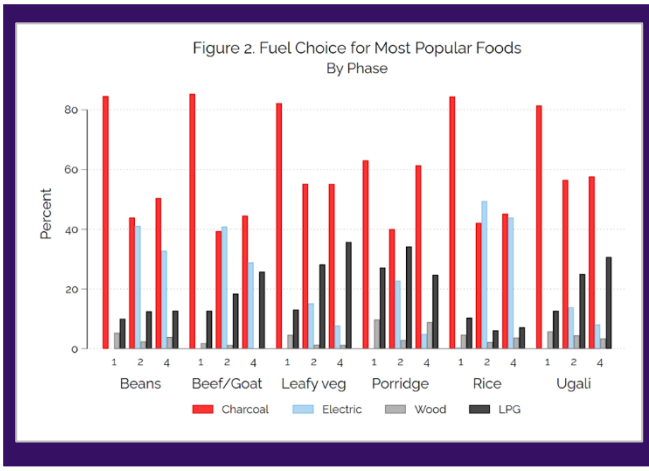
SESCOM: TANZANIA PILOT STUDY

Piloting innovative business models for accelerating uptake of efficient electric cooking appliances.

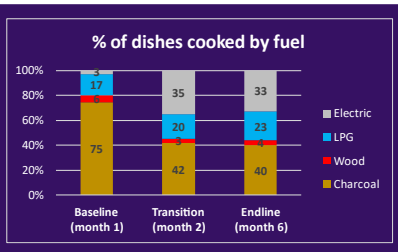
Image credit: M.Swai 2021

The ECO pilot study carried out by the Sustainable Energy Services Company (SESCOM) adds to the growing body of evidence demonstrating how electric pressure cookers (EPCs) can enable transitions to cooking with electricity in grid-connected households in Tanzania. Focussing on 50 households in Morogoro Municipality, the project evaluated EPC use via cooking diaries, data loggers, and feedback surveys, while also assessing appliance financing models. The project was led by SESCOM, with implementation from the Tanzania Forestry Research Institute (TAFORI) and data analysis from Nexleaf Analytics.

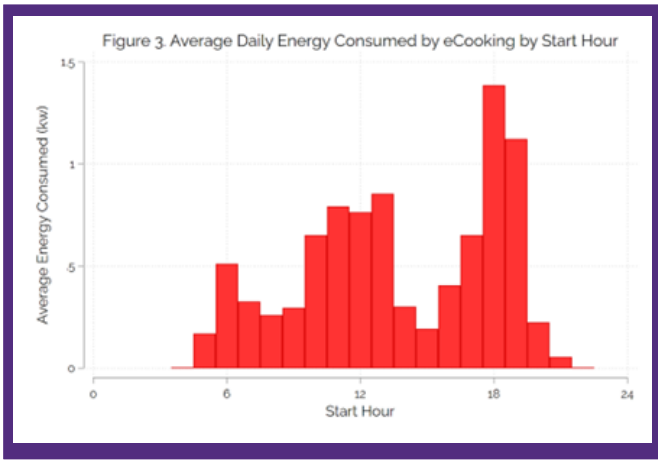
Key Facts
Location: Morogoro Municipality
Partners: TAFORI / NEXLEAF
Pilot size: 50 households



The shift in fuel choice was particularly noticeable with the staples, rice and beans, **shifting from being primarily cooked on charcoal (baseline) to being cooked nearly half the time with electricity (phase 2 onward).**



EPC use was significant and sustained. The percentage of dishes cooked with electricity **increased from 3% (baseline) to 33% (month 6) with a corresponding fall in the use of polluting charcoal.**



There was a clear trend towards evening use of EPCs, indicating the likely need to strengthen national electricity infrastructure to accommodate eCooking at scale

CONCLUSION

To enable greater and inclusive transitions to electric cooking (e.g. to low income households), **further research is required to build on the findings of this study and better understand how to advance the provision of adequate electricity and end-user financing and distribution.**

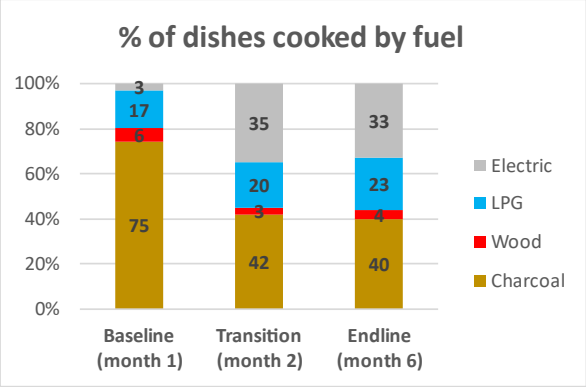


Figure 5. Cooking events per fuel per phase

FOCUSSING ON GRID-CONNECTED HOUSEHOLDS

Previous studies have demonstrated that Tanzanian foods can be successfully cooked on an EPC, and that EPCs have potential within micro and mini grid systems, depending on price point and power availability. However, grid-connected households (as focussed on in this study) are also an important potential market for EPCs, especially as the impacts of charcoal use in cities increases and countries aim to achieve universal electrification access.

ELECTRICITY EMERGES AS AN ALTERNATIVE TO CHARCOAL

Results from the cooking diaries showed a noteworthy shift in the cooking fuel "stack" among participating households with the introduction of the EPC, which was sustained throughout the course of the 6-month pilot (Figure 5). At the outset of the pilot, charcoal was the fuel of choice for 75% of cooking events, and electricity only accounted for 3% (use deriving from electric kettles, rice cookers, and microwaves). After the introduction of the EPCs in the transition phase (month 2), charcoal use dropped to 42% of events, with electricity climbing to 35%. This uptake was sustained with EPCs used for 33% of dishes cooked in the endline phase (month 6) while charcoal use dropped further to 40%. Interestingly, use of LPG also increased slightly over the course of the study after the introduction of EPCs, from 17% in the baseline to 23% of dishes cooked in the endline phase.

The shift in fuel choice was particularly noticeable when cooking certain food types. Rice and beans, for instance, shifted from foods cooked primarily with charcoal to being cooked nearly half the time with electricity. While the menu didn't change after the introduction of EPCs, households reported cooking more foods from scratch as opposed to reheating foods. These trends indicate that EPCs can enable electricity to be a viable fuel choice for grid-connected households.

RICE AND BEANS SHIFTED FROM FOODS COOKED PRIMARILY WITH CHARCOAL TO BEING COOKED NEARLY HALF THE TIME WITH ELECTRICITY

Figure 6. Women in Morogoro, Tanzania practicing cooking with EPCs (image credit: M.Swai, 2021).

SCALING UP ECOOKING: USAGE PATTERNS AND POWER SUPPLY

In order for electric cooking (eCooking) to expand, utilities must be able to plan for adequate power supply for communities, and systems must be built for households to afford the cookers. Usage patterns from the 50 households showed clear trends towards increased cooking on EPCs for preparation of the evening meal, with average energy consumption at 6pm nearly double that at midday. While none of the 50 households participating in the study reported power quality or loss of power affecting their ability to cook, patterns of usage have implications on a large scale if eCooking appliances are part of mass clean cooking campaigns or agendas.

SCALING UP ECOOKING: FINANCING MODELS

Scale up is also likely to be dependent on providing opportunities to accelerate distribution of EPCs to households unable or reluctant to pay the upfront costs of the cooker. The project tested appliance financing models which allowed for customers to pay for EPCs in instalments. Two microfinance organizations (a women employee micro financing facility and the University Graduate Entrepreneurs Cooperative) purchased EPCs at wholesale price from SESCOM and then sold to customers for payments in instalments. The scheme was more successful among members of the women employee microfinancing facility as all EPC recipients were employed and had a stream of income to make the recurring payments. This suggests sales are more likely to be viable with other microfinancing social groups in Morogoro with consistent cash flows.

WHAT'S NEXT: MAKING POTENTIAL A REALITY

There is now a strong base of evidence highlighting the potential of EPCs in the Tanzanian context, with the results of pilots such as these indicating that for those with electricity access, EPCs offer an appealing alternative to charcoal. Yet, in Morogoro, just 28.4% of households are connected to the electrical grid, below the national rate of 37.7%. This indicates that urgent action is required to integrate electrification and clean cooking policy to enable more households access to electricity and the eCooking opportunities this access can provide. This study therefore adds to the clear evidence base informing policy makers and utility providers of the need to build an electrical supply that can accommodate electric cooking at scale. To enable more equitable and inclusive transitions to electric cooking (e.g. to low income households), further research is required to build on the findings of this study and better understand how to advance the provision of adequate electricity and end-user financing and distribution.

For more information on this study, the SESCOM ECO final report is available on the MECS website.

Featured image, top: SESCOM's Mary Swai explaining to women in Morogoro how EPCs work (image credit: C. Balama, 2021).

GERES: MYANMAR PILOT STUDY

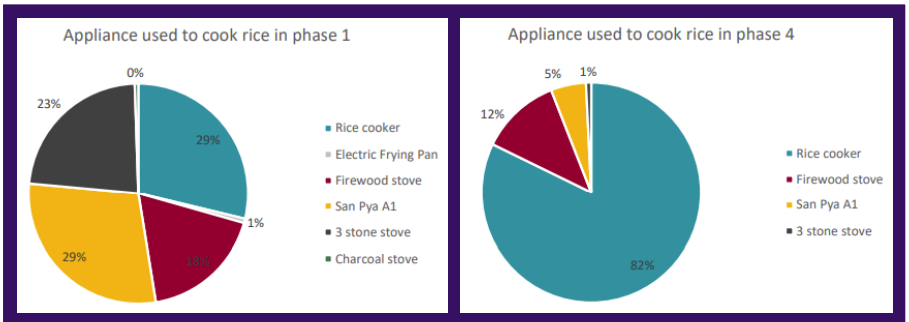
Rural Energy Access to Community and Households (REACH) in Myanmar

Image credit: Geres, 2021

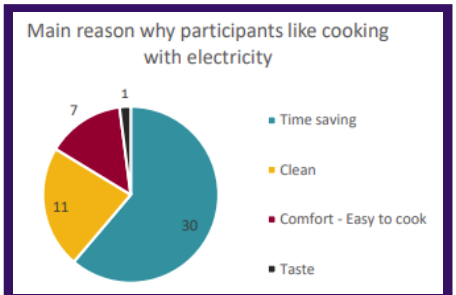
Focussing on 50 households in recently grid-connected villages in rural Thazi (Myanmar), the pilot study carried out by the French NGO, Geres found the adoption of electric cooking (eCooking) appliances – particularly rice cookers, kettles, and electric frying pans – to be rapid, significant, and long lasting.

By testing, selecting, distributing and monitoring eCooking appliances via a community-based entrepreneur network, the pilot study demonstrated how adopting a holistic approach can unlock unrealised potential for transitions to electric cooking.

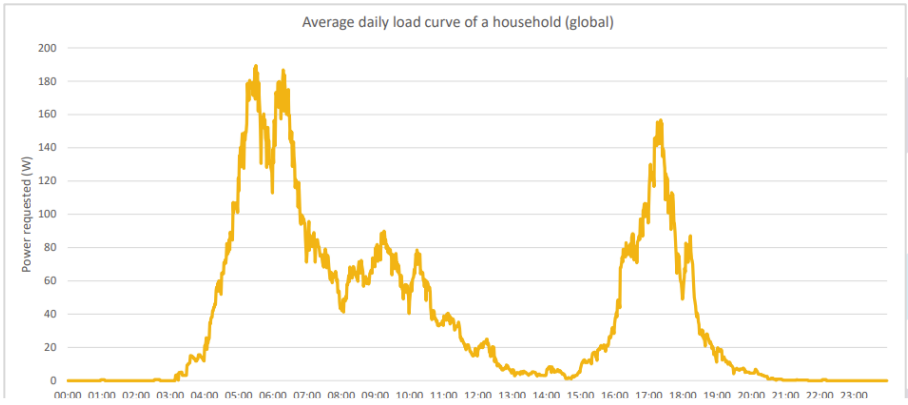
Key Facts
Location: Thazi Township (Meiktila District)
Partners: Ah Lin Tan
Pilot size: 50 households



Rice was by far the most cooked dish, accounting for over 40% of dishes cooked in each phase. In the baseline (left), rice was cooked on electricity for 29% of events. However, by the endline phase (right), **rice cooking had been transformed, with electricity (rice cookers) now used for 82% of rice cooking events**



Participants particularly liked eCooking because it saves time, enabling more time for activities such as work, daily or household tasks, prayers and entertainment.



eCooking coincided with and increased the existing morning and evening peak

CONCLUSION

By stimulating the beginnings of a supply chain and showing there is sustained demand for eCooking even in last mile locations, the research provides an evidence base to inform policy makers and investors on the clear opportunities to scale electric cooking in Myanmar.

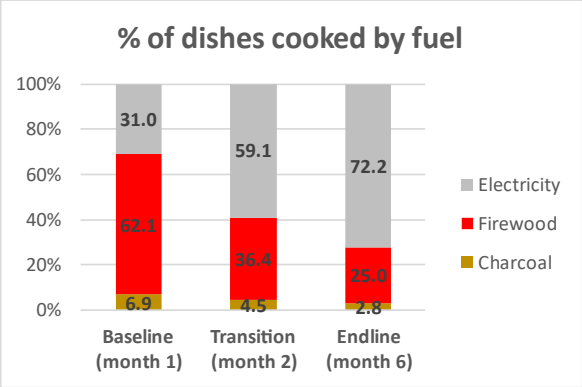


Figure 7. Cooking events by fuel per phase

SUSTAINED UPTAKE

The introduction of eCooking appliances in the transition phase (month 2) led to cooking events with electricity more than doubling compared to the baseline (month 1) (Figure 7). People chose to cook with electricity throughout the 6-month pilot. By phase 4 (month 6), eCooking had increased further still to approximately two thirds of all cooking events, with huge reductions in the use of polluting firewood (60% decrease) and charcoal (almost completely abandoned) compared to the baseline. The effect on rice cooking was particularly noticeable, with 80% of rice cooking events now on electric rice cookers compared to less than 30% in the baseline phase. The Geres project lead, stressed household preferences for eCooking were clear: “people don’t want to go back to charcoal or firewood”.

eCooking was also compatible with cultural cooking practices as households did not change their menus after obtaining their appliances. Households highlighted eCooking was easier, cleaner, cheaper, and, above all, more convenient and saved time – the average time spent cooking per day decreased by more than 30 minutes. These benefits are particularly relevant to women who are the main cooks in Myanmar and disproportionately affected by the household air pollution, health impacts, and daily drudgery associated with cooking with firewood and charcoal.

While households clearly wanted to cook with electricity, lack of access to quality eCooking appliances (due mainly to upfront cost and last mile availability) was the main barrier to uptake in rural areas. Perceptions that eCooking is unsafe were also common due to a lack of information: over 50% of the participants held outdated perceptions that electricity is more dangerous than other cooking fuels.

DEVELOPING A WOMEN’S ENTREPRENEURS’ NETWORK

To help address the challenges above and develop the clear opportunities for eCooking, a social enterprise named ‘Ah Lin Tan’ was created via the Geres REACH project to support and train a last mile women entrepreneurs’ network to sell eCooking appliances, with the ECO pilot findings strengthening the network’s sector knowledge and marketing strategies. Ah Lin Tan faced challenges as Covid-19 and political unrest significantly impacted sales. In addition, local appliance suppliers are affected by supply chain issues limiting their ability to offer the same

“PEOPLE DON’T WANT TO GO BACK TO CHARCOAL OR FIREWOOD”

Figure 8. Entrepreneurs training workshop in Meiktila (Image credit: Geres 2021)

products consistently, causing Ah Lin Tan and the entrepreneurs to have difficulties developing marketing and pricing strategies – which can lead to loss of trust from customers. Scale is likely to be key: more trained entrepreneurs may lead to more sales, opening up opportunities to buy products in larger quantities and/or import products or even brand them and become less dependent on local suppliers.

TESTING E-COOK APPLIANCES IN THE MYANMAR MARKET

To address the lack of quality control and increase consumer confidence within Myanmar, Geres pre-selected over 80 locally available eCooking appliances and tested the most relevant ones (via energy efficiency tests, safety tests, and consumer focus groups) as part of the ECO study. This testing then allowed Geres to select devices for field tests and sales. Price, design, brand, warranties, and above all, a preference for higher quality goods emerged from the consumer focus groups. Test results were detailed in two reports and incorporated into the MECS Myanmar eCookbook (English) (Burmese). The product testing was also used to devise marketing strategies (channels, target clients, pitch and pricing) for each appliance type. This supported the key role of Ah Lin Tan in training female entrepreneurs to sell devices and find solutions like flexible payment facilities, and provided an evidence base to increase consumer confidence in eCooking.

BARRIERS TO WOMEN'S ENTREPRENEURSHIP STUDY

Complementing the pilot, a study on intervention strategies to remove barriers to women's entrepreneurship was also conducted. Not feeling comfortable to travel and sell alone, lacking confidence to speak to strangers, domestic chores limiting time to network, and access issues to transportation to carry heavy/large products were the main barriers identified. The study noted emerging opportunities for female entrepreneurs from the expanding range of electrical appliances (including eCooking devices) which have enabled complimentary or larger devices (e.g. larger rice cookers) to be sold alongside more established product lines. Moreover, the study revealed a significant opportunity for the entrepreneurs to add after sales service of electrical products as a value added proposition. Repair and maintenance is complicated in 'last mile' rural areas as without a certain level of sales, it is impossible to cover the logistics costs of returning relatively inexpensive products to the supplier. Yet being locally based, the Ah Lin Tan trained entrepreneurs can help mitigate this issue by carrying out local repair or diagnostic advice of faulty appliances.

CONCLUSION

By stimulating the beginnings of a supply chain and showing there is sustained demand for eCooking even in last mile locations, the research provides a critical evidence base enabling MECS to inform policy makers and investors on the clear opportunities to scale electric cooking in Myanmar.

For more information on the study, the Geres ECO final report is available on the MECS website.

Featured image, top: recording energy usage data on eCooking devices – part of the cooking diaries approach (image credit: Geres, 2021).

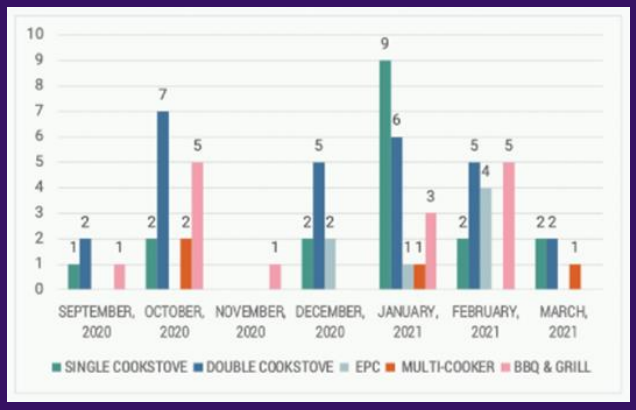
IDE: CAMBODIA PILOT STUDY

Future solutions for boosting electric cooking in Rural Cambodia

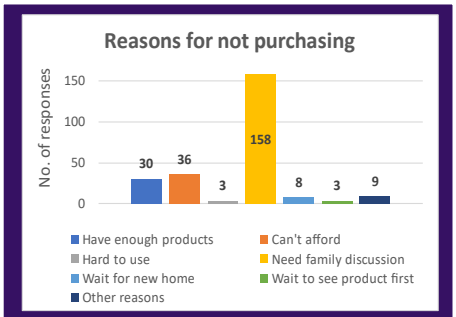
Image credit: Bansod, 2021

If purchased or made available, people in Cambodia consistently cook with electric cooking (eCooking) devices. This is the clear message from the international non-profit organisation, iDE's six-month ECO pilot study. The pilot found people preferred the taste of food cooked on electricity (including the staple rice) and eCooking was far cheaper than LPG or charcoal, alligning with previous studies that show eCooking fits local cooking practices. Given these benefits, the study focussed on how to convince more people to buy an eCooking device and move away from biomass cooking, which causes 12,000 premature deaths in Cambodia each year through household air pollution (ADB, 2015).

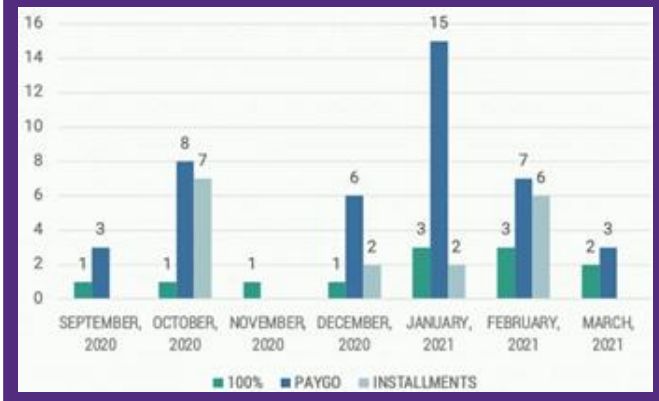
Key Facts
Location: peri-urban Phnom Penh
Partners: Hydrologic, ATEC
Pilot size: 928 people pitched to & 30 customers monitored



Products sold per month: **Reducing monthly payments** by **offering longer payback periods** and introducing **free trials** in January had **most impact on sales**



The need to hold **a family discussion was by far the main barrier behind non-sales** and led to the decision to **prioirtise weekend pitches**.



83% of products were sold via flexible payment mechanisms (PAYGO or credit instalments), highlighting the importance of financing for overcoming upfront cost barriers

CONCLUSION

People already consistently use eCooking devices in Cambodia. **Getting the marketing mix right can convince people of the affordability, ease and convenience of cooking on electricity (the benefits which resonate most with customers) and accelerate sales of eCooking devices.**

THE 5PS MARKETING MIX

To address the question of how to convince people of the benefits of eCooking and increase sales, iDE used the '5Ps' (Product, Price, Promotion, Place and People) marketing framework to understand how iteratively adjusting the marketing mix could facilitate sales of eCooking devices. The framework simplified the complexity of an iterative sales project, guiding decision making on which 5Ps needed to be refined and how. These adjustments were informed by sales data and feedback from customers and non-customers using qualitative (surveys, interviews) and quantitative (usage data) methods.

During the study, 928 people were pitched to: 59 (6.3%) became customers with 71 products sold. Sales were constrained by Covid-19 restricting access to customers but improved significantly during and after the pilot as marketing adjustments were refined.

PRODUCT

The products market tested during the pilot were: single and double induction stoves, electric grills, electric pressure cookers (EPCs), and multicookers. eCooking is already familiar in Cambodia through the widespread use of electric rice cookers, which pointed to the potential for the pilot to market test these other efficient eCooking devices to meet additional cooking needs.

Induction stoves were by far the most sold device (47 of the 71 sales), proving versatile, affordable and aspirational, while enabling customers to cook most everyday dishes without challenges. 68% of non-customers surveyed also indicated interest in purchasing an induction stove in the future. Sales of other devices were more difficult. The electric grill (14 sales) was seen as a convenient alternative to charcoal grilling but too small. EPCs (6 sales) were challenging to sell as both sales agents and customers lacked understanding of the functions and buttons to cook different dishes: many perceiving (and customers often using) the EPC as an expensive rice cooker. Limited functionality (steaming and boiling) of the multi cooker and the small size led to only four sales.

PRICE

Reducing monthly payments for all devices (by offering longer payback periods) and free month-long trials for induction stoves were the marketing refinements with most impact on sales. Both were introduced in January, significantly increasing sales. Overall, 83% of products were sold via flexible payment mechanisms (PAYGO or credit instalments), highlighting the importance of financing for overcoming upfront cost barriers. The free trials also generated interest during sales pitches, permitting sales conversations to develop which had often previously stalled due to concerns over price and the unfamiliarity of some eCooking devices. The offer reduced barriers to entry by enabling people with negative past eCooking experiences to see newer devices were a marked improvement on older models.

PROMOTION

Due to the interest generated from pricing experiments, lifetime cost comparisons for different cooking fuels (e.g. appliance, fuel, and maintenance costs) were calculated and integrated into sales pitches. Comparisons showed significant savings with eCooking, mainly because fuel costs were approximately half those of LPG and charcoal (Table 2). Integrating these comparisons positively impacted sales conversations and likely contributed to the improved sales towards the end of and after the pilot. To address safety (the other main customer concern), sales agents showed customer satisfaction surveys during pitches which highlighted that previous customers felt eCooking was safe.

Table 2. Monthly cost of cooking three meals a day with different fuels

eCooking	LPG	Charcoal
6$	11.25$	14$

GRANDMOTHERS AND STAY-AT-HOME MOTHERS EMERGED AS KEY CUSTOMER SEGMENTS

Figure 9. The wide range of eCooking devices demonstrated at a community event (image credit: Bansod, 2021)

However, by far the most common reason cited for not purchasing an appliance was the need to first have a family discussion (81% of non-customers). In response, sales agent working hours were adjusted to accommodate weekend sales pitches. This facilitated family buy-in and far quicker decisions to purchase as the whole family was present and able to engage in the complex decision-making surrounding the purchase of an eCooking device and a new way of cooking.

PEOPLE AND PLACE

Alongside innovator and early adopter customer types, the project revealed grandmothers and stay-at-home mothers as a likely key customer base; the two groups used eCooking appliances the most while elders drove decision making regarding fuel and appliance choices.

Also crucial are the people selling. Door-to-door marketing was conducted by sales agents from Hydrologic (iDE's clean water social enterprise subsidiary), whose local water filter sales and distribution network helped reach customers; although retraining agents to understand eCooking products and identify customer types slowed sales. Community cooking events, live demonstrations, and engaging customers with video content also proved effective at triggering sales.

DIGITAL MARKETING

Digital advertising approaches were also market-tested, with most traffic generated by targeting Facebook groups for house appliances, recipes, and cosmetics. Simple, easily visualised messages on ease and convenience worked best. For instance, 'eCooking frees up time to watch TV programmes', which targeted the key stay-at-home mother and grandmother customer segments. More abstract messages on being a 'supermom/gran' did not gain traction as audiences were unclear what a 'supermom' was. Digital advertising helped create product awareness but converting to direct sales proved challenging.

CONCLUSIONS & WHAT NEXT?

The evidence base from this project highlights how getting the marketing mix right can convince people of the affordability, ease and convenience of eCooking (the benefits which resonate most with customers) and accelerate sales of eCooking devices. Integration of these key learnings (Table 3) has seen sales increase threefold post-pilot. To further increase uptake in Cambodia, research is required to see if these marketing insights are also applicable to last-mile households most affected by the health, time, and economic impacts of cooking with biomass. Innovative financing mechanisms (e.g., carbon financing, smart subsidies) and awareness raising programmes can also help reach these most-in-need households.

Table 3. Summary of 5P changes most impacting sales

5P	Key refinements
Product	Induction stoves (single and double)
Price	Flexible financing mechanisms, Reduced monthly payments, free trials
Promotion	Incorporating cost comparisons into pitches, weekend pitches
People & Place	Grandmothers/stay-at-home mothers, sales agent training on products and customer types, utilising local agent networks, live cooking events

For more information on this study, the iDE ECO final report is available on the MECS website

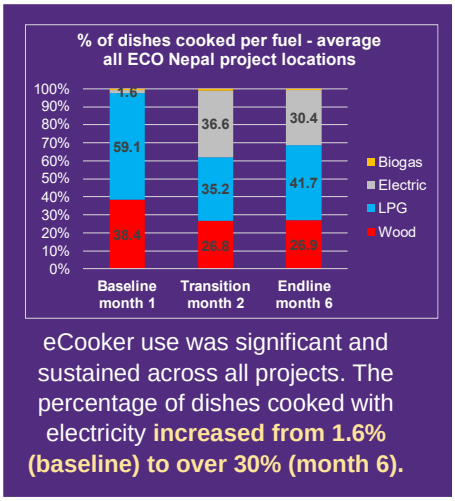
Image, top. Potential customers cooking and trying food on an electric grill. These kinds of interactive community cooking events hosted at local restaurants with local chefs proved effective at triggering sales (image credit: Bansod, 2021).

NEPAL: ELECTRIC COOKING OUTREACH

The first large-scale, evidence based research informing scale up of electric cooking in Nepal

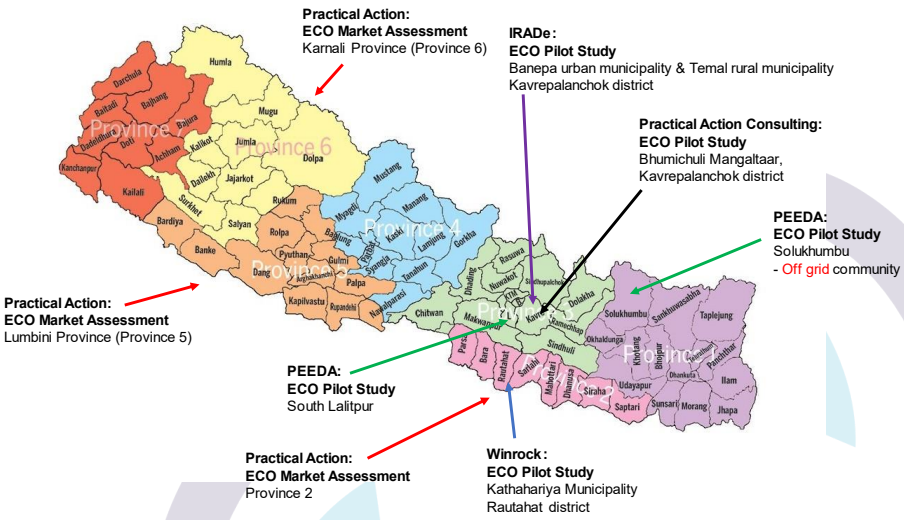
Image credit: Winrock International, 2021

The ECO Challenge fund funded five projects in Nepal: one market assessment and four 6-month eCooking pilot studies reaching over 300 households. Carried out by Integrated Research & Action for Development (IRADe), People, Energy & Environment Development Association (PEEDA), Practical Action Consulting, Practical Action Nepal, and Winrock International, this first large-scale, evidence based research on eCooking scale up in Nepal provides new insights into the clear opportunities for scaling electric cooking in Nepal.



eCooker use was significant and sustained across all projects. The percentage of dishes cooked with electricity **increased from 1.6% (baseline) to over 30% (month 6).**

User experiences of eCooking were **overwhelmingly positive**: **ease of use, convenience, taste, time and cost savings** were especially praised.



The Nepal ECO projects had a wide geographical spread enabling local variations of cooking practices and market opportunities to be captured. The market assessment focussed on three of Nepal's seven provinces, while the pilot studies were spread across six municipalities in four districts. This geographic breadth was intended to strengthen confidence in findings and provide a more compelling evidence base to support the development goals and strong opportunities for scaled eCooking signaled by the ambitious national policy framework targets.

The results were highly encouraging. The market assessment found the current and near future opportunities for eCooking to be very promising, while eCooking uptake was rapid, significant and sustained in all pilot study locations, with people from various cultural and socio-economic groups in both grid and off-grid locations willing to use and pay for EECAs.

CONCLUSION

Nepal is a key priority country for MECS, and the policy environment in Nepal is highly favourable for eCooking. To unlock the clear opportunities to scale eCooking, **greater focus is needed to address grid supply and reliability issues, improve after sales services, and increase access to financial resources for low-income households to purchase eCooking appliances.**

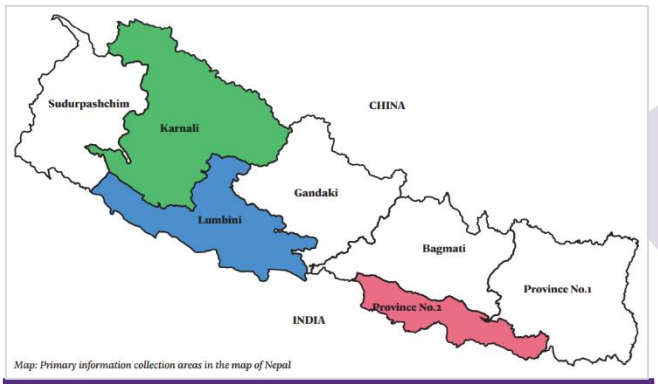
PRACTICAL ACTION: NEPAL MARKET ASSESSMENT

Market Assessment of Efficient Electric Cooking Appliances in Nepal

MECS Modern Energy Cooking Services

Image credit: Practical Action Nepal, 2021

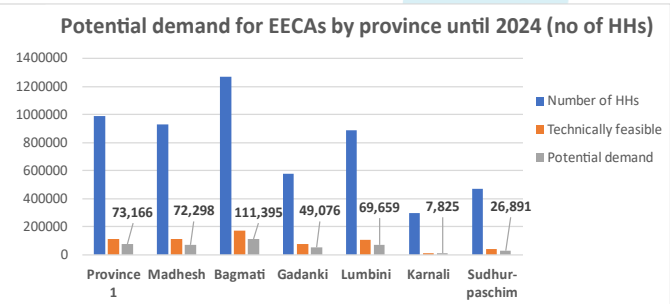
Practical Action's market assessment found the current and near future opportunities for eCooking in Nepal to be highly promising due largely to increasing domestic hydropower production, rising consumer demand for clean cooking, and a highly supportive national policy framework. The study drew on federal, provincial (Madhesh, Lumbini and Karnali provinces), and local level consultations as well as 310 household surveys to assess the market opportunities for eCooking and provide a basis for developing scale up strategies. The project was carried out by the Nepali NGO, Practical Action Nepal with project partners: Sundar Nepal, Development Concern Society (DECOS), and the Environment Protection Center (EPC) Nepal.



Map: Primary information collection areas in the map of Nepal

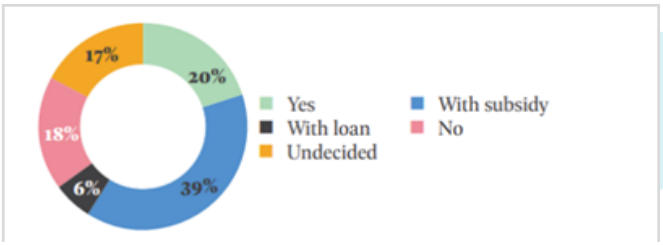
Key Facts

Location: Nepal (Madhesh, Lumbini, Karnali provinces)
Partners: Sundar Nepal, DECOS, EPC Nepal
Sample size: Federal, provincial and local level consultations + 310 household surveys in six municipalities



'Technically feasibile' based on no. of connected HHs and a technical feasibility factor of0.15.
'Potential demand' based on a demand and capacity to pay factor of 0.648 that was derived from the aggregated household survey data carried out for this market assessment.

Based on current electricity access and infrastructure, consumer demand, and household capacity to pay, the market assessment estimated a potential uptake of 410,000 EECAs in Nepal by 2024. **Yet, a much quicker and larger uptake is possible if key barriers are addressed.**



65% of surveyed households were interested to switch to eCooking; of whom 45% would require either a subsidy or loan, **indicating how financing is key for EECA uptake.**

Among the sampled household, the main motivating factors for using eCooking appliances **were ease of use, time saving and fuel efficiency.**

CONCLUSION

The market opportunities for scaling eCooking in Nepal are highly promising and can be accelerated if key electricity distribution infrastructure, demand side management and stakeholder coordination barriers are addressed.

METHODS AND APPROACH

The study focussed on six core areas identified as critical to faciliating a successful eCooking market: the enabling environment, the financing ecosystem, key stakeholders and their activities, the electricity supply, eCooking appliance supply chain, and consumer preferences. The enablers and barriers for each were assessed via a combination of deskbased reseach, stakeholder consutations, and households surveys in order to assess opportunites for eCooking and provide recommendations for scaling outreach.

ENABLING ENVIRONMENT

Enablers: eCooking is a key priority of the Government of Nepal (GoN), as reflected in policies such as the 15th National Plan, and Nepal's Nationally Determoned Contributions (NDCs) which target 25% of all households using electricity as the primary fuel for cooking by 2030. The reduction of customs duty on induction cookstove imports from 15% to 1% in 2021 further supported uptake.

Barriers: There are inadequate interlinkages between the policy framework, regulation, and the financial allocations from all three tiers of government and non-government organisations. Clean cooking is still not prioritised by most local governments; most do not have energy sub-committees nor Municipality Energy Plans. The current tariff system also deters poorer households from upgrading to the more expensive meter connections and tariffs required for scaled eCooking.

FINANCING ECOSYSTEM

Enablers: All levels of government have expressed interest to increase public funding for eCooking promotion, while non-government agencies are keen to mobilise resources to develop the eCooking market. Local financial institutions interviewed expressed interest to provide retail/customer loans for eCooking products, which suggests there may be significant potential for local finance to support eCooking as Nepal has 85 micro-finance institutions (MFIs) with branches in multiple locations, and over 34,000 cooperatives.

Barriers: Although public funding commitments are increasing, the funds allocated are insufficient to meet government eCooking targets. Likewise, private sector investment is increasing but not at the rate required. For commercial and development banks, consumer financing of eCooking is not viable as the loans required are very small while transaction costs are high. There is also a general hesitance to invest in what is considered a new investment avenue.

KEY STAKEHOLDERS

Enablers: eCooking is a priority area for the GoN and key energy parastatals, such as the Nepal Electricity Authority (NEA), and increasingly, the Alternative Energy Promotion Centre (AEPC) who have partnered with local government and NGOs on several eCooking distribution initiatives (both market-based and subsidised). The World Health Organisation and MECS consider eCooking as the optimum clean cooking option for Nepal, the latter funding a range of in-country research initiatives. There is also increasing interest from international development agencies (e.g., GIZ, CCA), the private sector and civil society.

Barriers: There is lack of coordination between key stakeholders to promote eCooking. Notably, the incentives or subsidies provided by different programmes and projects are not uniform, which creates confusion and disrupts market growth.

IF SUPPORTED, THERE IS HUGE POTENTIAL FOR MFIS AND COOPERATIVES TO PROVIDE URGENTLY NEEDED LOCAL FINANCING FOR EECAS

ELECTRICITY SUPPLY

Enablers: The recent increase in domestic hydroelectricity production creates significant potential to use surplus power to support eCooking at scale, with medium and long-term government planning targeting eCooking as an important load for this increased capacity. The many off-grid micro-hydropower systems in Nepal can also support eCooking, with cooking available at night (unlike off-grid solar), while managers of such systems can control tariffs to incentivise uptake.

Barriers: The inadequacies of the electricity distribution infrastructure, particularly in rural areas, are the single biggest barrier to scaled eCooking. These issues mean universal use of eCooking as the primary mode of cooking is currently not feasible, while frequent power cuts and voltage fluctuations also undermine consumer confidence in the technology. The Nepali grid's reliance on run-of-the river hydropower leads to huge seasonal variations in electricity supply, indicating scaled eCooking as feasible in the wet season, but requiring significant peak power imports during the dry.

E-STOVE SUPPLY CHAIN

Enablers: Major trends affecting positive market growth are: (i) increased stimulus efforts from government and development partners providing thrust to the market, (ii) existing private sector organisations investing more to cater for growing demand, and (iii) new companies entering the market because of increasing demand and public funding support. The effect of more competition in the eCooking stove market is also becoming visible in terms of price and product differentiation.

Barriers: Several factors currently impede the growth of the eCooking market. As most appliances are imported, bulk purchasing is required which creates high upfront investment costs for importers and suppliers – a risk when demand remains unknown. The lack of active importers and suppliers also means competition is limited and the market restricted to the major cities, with few retail or after sales service centres (e.g., for repair) in peri-urban and rural areas. The latter is critical given customer doubts over the durability of appliances and the current lack of enforcement of EECA standards which has seen an influx of low-quality products.

CONSUMER PREFERENCES

Enablers: The household surveys indicated clear demand for eCooking. The majority (65%) were interested to switch to eCooking; of whom 39% wanted to switch if publicly funded financial incentives were available while 6% required soft loans. The main motivating factors for using eCooking appliances were ease of use, time saving and fuel efficiency. Health was not a driving factor for eCooking (only 1%) despite broader consumer knowledge of household air pollution leading to increased LPG uptake. This suggests greater awareness efforts are required to inform consumers that eCooking has the same clean air benefits as LPG but with lower fuel cooking costs.

Barriers: There is a lack of consumer awareness about the costs and benefits of eCooking, with many still holding perceptions that eCooking is expensive and unsafe. Concerns about electricity supply reliability also hinder uptake, while some communities are hesitant to change existing cooking practices. Critically, poor families lack capacity to pay for appliances and electricity bills, (often more than 5% of monthly income). An issue compounded by the lack of consumer finance.

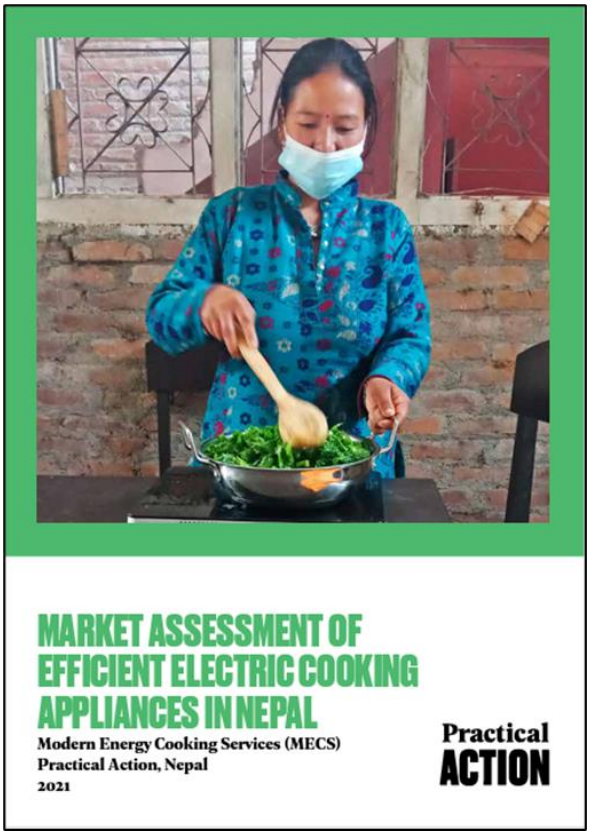
IMPROVING ELECTRICITY SUPPLY RELIABILITY, REVISING TARIFFS, AND COORDINATED PLANNING ARE THE MAIN RECOMMENDATIONS FOR UNLOCKING THE CLEAR ECOOKING OPPORTUNITIES IN NEPAL

CONCLUSIONS & KEY POLICY RECOMMENDATIONS

The market opportunities for scaling eCooking in Nepal are very promising. Based on current electricity access and infrastructure, consumer demand, and household capacity to pay, the study estimates a potential uptake of 410,000 EECAs in Nepal by 2024. Yet, a much quicker and larger uptake is possible if key barriers are addressed. The most important recommendations for unlocking this potential are:

- Improve the electricity distribution and demand-side management (especially dry season) to increase the reliability of the electricity supply.
- Revise tariffs by increasing the quantity of units in the lower bands to accommodate eCooking.
- Develop a national clean cooking strategy to facilitate coherent planning and investment, and clarify the roles of different tiers of government and non-government stakeholders
- Encourage private sector eCooking investment by addressing working capital needs and risk management via challenge or guarantee funds.

For more information on this study, the Practical Action Nepal Market Assessment is available on the MECS website.



IRADe: NEPAL PILOT STUDY

Testing Electric Pressure Cooker adoption in the Socio-economic and Cultural Context of Nepal.

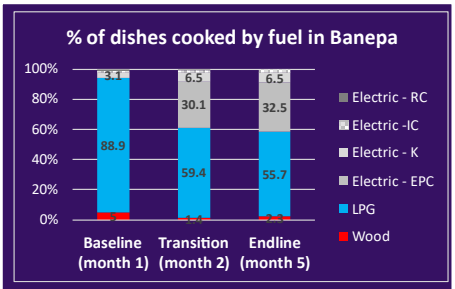
MECS Modern Energy Cooking Services

Image credit: IRADe, 2021

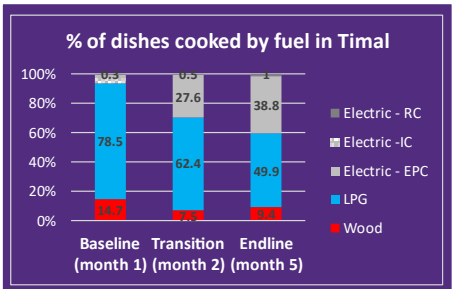
IRADe' ECO pilot study demonstrates how quickly people in both urban and rural communities can adopt electric cooking and transition to using the technology on a sustained basis. The five-month pilot reached 80 across two women communites: one in Banepa urban municipality, the other in Timal rural municipality. The study was conducted by the non-profit, research institute, Integrated Research & Action for Development (IRADe), with project partner, Women Awareness Center Nepal (WACN).

Key Facts

Location: Banepa Urban Municipality & Timal Rural Municipality (Kavrepalanchok District)
Partners: WACN
Pilot size: 80 households

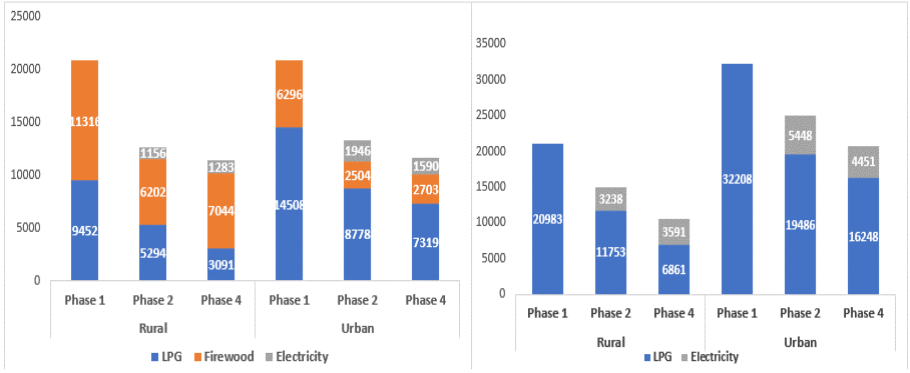


EPC use was significant and sustained in urban Banepa. Once introduced, EPCs accounted for **30.1% of dishes cooked in month 2 and 32.5% in the endline phase (month 5).**



EPC uptake was even higher in rural Timal, **accounting for 38.8% of cooking events in the endline phase (month 5).**

The EPC used in the pilot received very positive user feedback. Others in the community **were keen to buy the same model despite it being one of the most expensive in the Nepali market.**



The introduction of EPCs enabled households to make **significant savings in cooking energy (left) and fuel costs (right).**

CONCLUSION

The findings from the project further strengthen the evidence base for eCooking in Nepal by highlighting how **women community networks and product quality facilitate swift and sustained eCooking adoption.**

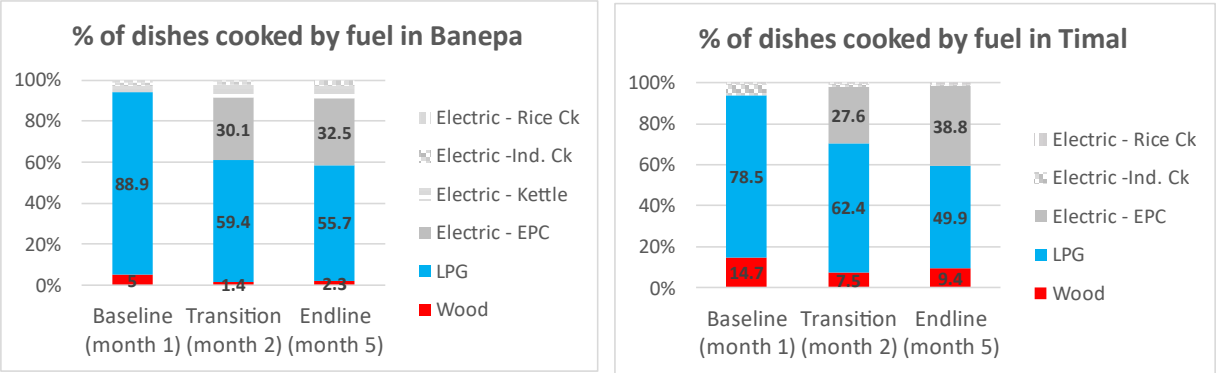


Figure 10-11. % of dishes cooked per fuel by phase in urban Banepa (left) and rural Timal (right)

SWIFT AND SUSTAINED ECOOKING TRANSITIONS LOWER FOSSIL FUEL USE

During the pilot, subsidised EPCs were distributed to the 80 women participating in the study, with usage monitored through cooking diaries, energy meters and surveys. Results from the cooking diaries showed the transition to eCooking was particularly swift (Figures 10-11). At the start of the pilot, LPG was the main fuel of choice, accounting for 89% of cooking events in Banepa and 79% in Timal, while electricity only accounted for 6% in each community (use deriving from kettles, rice cookers, and induction cookers). Once introduced, EPCs accounted for 30.1% and 27.6% of cooking events in Banepa and Timal respectively, resulting in LPG use falling to 59% (Banepa) and 62% (Timal). By the endline phase (month 5), use of EPCs had increased further still to 32.5% (Banepa) and 38.8% (Timal). The higher eCooking usage in Timal was partly driven by LPG being more expensive than in Banepa due to difficulties in transporting the fuel to the community's rural location.

The five-month pilot reached 40 households from Sahara Nari Chetna Skill Cooperative, a women community in Banepa urban municipality, and 40 from Sabal Nari Chetna Agriculture Cooperative, a women community in Timal rural municipality. The study assessed whether electric pressure cookers (EPCs) were compatible with the local electricity supply and the socio-economic and cultural context of the communities.

WOMEN COMMUNITY NETWORKS FACILITATE ADOPTION OF ECOOKING

Households were overwhelmingly positive about the EPC. Although cooking took slightly longer, the women participating in the study liked that the EPCs did not need to be continuously monitored, enabling them to carry out business activities and other household tasks. Participants praised the cost effectiveness of the EPC and were very conscientious of the large savings they were making compared to LPG.

Households also liked that they could cook most dishes on the EPC and reported food tasted just as good and sometimes better compared to their previous stoves, with chicken and meat dishes more tender. Overall, the menu changed little during the pilot, indicating the EPC fits local cooking practices.

INTER-COMMUNITY SUPPORT WAS KEY IN ENABLING THE SWIFT AND SUSTAINED ECOOKING TRANSITIONS

"*Food cooked on EPC tastes very good, as it evenly cooks the food, and I can do other work while the food cooks on EPC. I would prefer electric cooking as it is cheaper than LPG.*"
(Banepa resident)

Inter-community support was another notable feature of the pilot, with younger participants – who tended to adopt the technology more quickly – helping older community members to use the EPC. This support facilitated the swift, sustained eCooking transition and led to innovations in EPC use, particularly in Banepa where some households began using bowls as separators to enable simultaneous cooking of rice and pulses.

Figure 12. Use of bowl to cook two dishes simultaneously in an EPC (image: IRADe, 2021).

AFTER SALES SERVICES AND PRODUCT QUALITY DRIVE UPTAKE

The positive user experience saw many households express an interest in buying a second EPC to facilitate simultaneous eCooking. Many households other than the study participants have planned to place a joint order in time for the local festival to avail bulk/festival discounts. People were keen to buy the same model used in the pilot despite the device being one of the most expensive in the Nepali market. This was due to their positive experiences during the pilot and because the EPC was from a well-known international brand, which was consistently available in the Nepali market, and had dedicated in-country repair and maintenance centres which increased confidence in the technology. At present, the repairing centres are mainly located in Kathmandu. The provision of local eCooking after sales services will reduce the apprehension of people about the EPC thereby promoting its uptake.

ELECTRICITY RELIABILITY LIMITS HOUSEHOLDS USING EPCS AS MUCH AS THEY WANT

To expand eCooking uptake further, a greater focus on addressing the reliability of grid electricity is required. Voltage quality was an issue during the pilot and when power cuts occurred, 50% of participants reported the interruption forced them to switch to other cooking fuels. Furthermore, households mainly used their EPCs between 6-9am and 5-8pm, coinciding with peak electricity demand, which could cause issues for up scaling eCooking if grid reliability and demand side management are not improved.

CONCLUSIONS & NEXT STEPS

The findings from the project further strengthen the evidence base for eCooking in Nepal by highlighting how women communities can support swift, significant, and sustained eCooking uptake. The project also shows how the quality of the product and the availability of after sales services are crucial for inspiring consumer confidence in eCooking and can lead to increased demand for eCooking appliances. To realise the clear opportunities for a greater shift to eCooking in Nepal, increased efforts are required to develop a more reliable electricity system. Consumer awareness campaigns and improved quality benchmarking are needed to support eCooking at scale as many households are unaware of the benefits or which eCooking devices to purchase. Research is also required into how financing solutions might address the potential upfront cost barriers of purchasing an appliance and facilitate more inclusive eCooking transitions.

For more information on the study, the IRADe ECO final report is available on the MECS website.

PEEDA: NEPAL PILOT STUDY

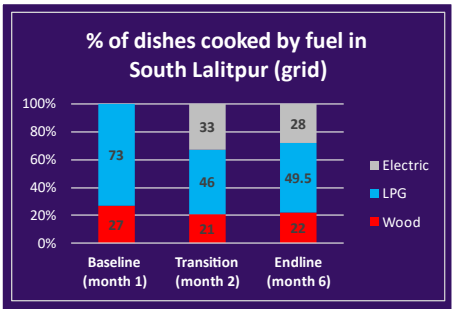
Understanding the Suitability of Electric Pressure Cookers in Nepali Households

Image credit: PEEDA, 2021

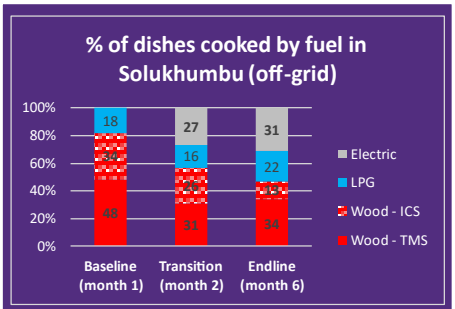
PEEDA's ECO pilot study in Nepal demonstrates how the low power consumption of electric pressure cookers (EPCs) enables far greater numbers of people to consistently cook with electricity. 160 households across grid-connected South Lalitpur and an off-grid, micro-hydropower community in Solukhumbu took part in the study, which aimed to see whether EPCs fit the electricity supply and cooking culture of the communities. The project was carried out by the Nepali NGO, People, Energy and Environment Development Association (PEEDA) with project partners: University of Bristol; Kathmandu Alternative, Power and Energy Group (KAPEG); and Access to Energy Institute (A2EI).

Key Facts

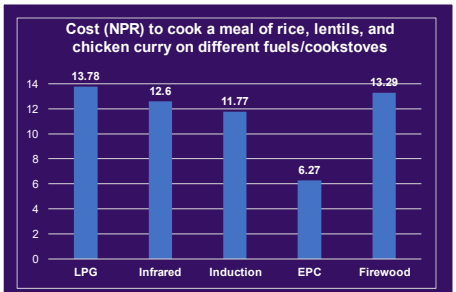
Location: Mahankal Rural Municipality (Lalitpur District) & Nechasalyan Rural Municipality (Solukhumbu District)
Partners: Uni. Bristol, KAPEG, A2EI
Pilot size: 160 households



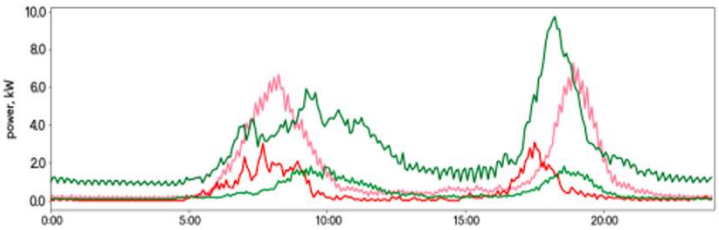
eCooker use was significant and sustained. The percentage of dishes cooked with electricity **increased from 0% (baseline) to 28% (month 6).**



…Similarly, in Solukhumbu, the percentage of dishes cooked with electricity **increased from 0% (baseline) to over 30% (month 6).**



Cooking a typical Nepali of rice, daal and chicken on a highly efficient **electric pressure cooker (EPC) was half the cost of cooking the same meal on LPG and firewood.**



Average EPC load profiles across a 24-hour period (red - Solukhumbu/off-grid, green South Lalitpur/on-grid).

eCooking coincided with existing morning and evening peak demand. **However, highly efficient EPCs draw far less power than other appliances** as they do not draw power continuously once pressure is reached. As a result, both **grid and off-grid sites could accommodate more households using eCooking**.

CONCLUSION

The findings shows how **low EPC power consumption unlocks eCooking access for a greater number of people even in off-grid locations or places with irregular grid supply.** To expand eCooking further, **a more reliable power supply and local after sales services are required**

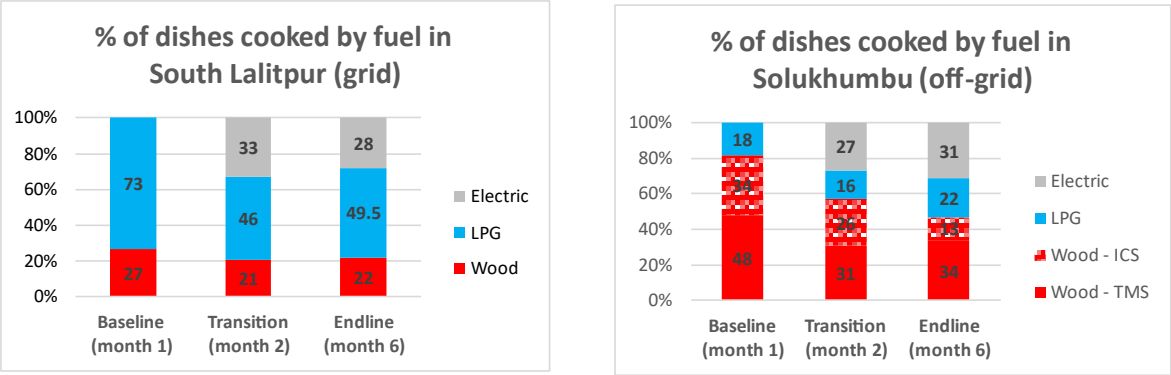


Figure 13-14. % of dishes cooked per fuel by phase in South Lalitpur (left) and Solukhumbu (right)

ECOOKING LEADS TO FAR LOWER FOSSIL FUEL USE

The project initially distributed EPCs to 30 households in each site and monitored use through cooking diaries, dataloggers and surveys. Once introduced, the use of EPCs was significant and sustained. Figures 13-14 show that EPCs accounted for approximately 30% of cooking events in both sites from the transition (month 2) to the endline phase (month 6). Households also stated they intended to use the EPCs daily after the pilot. The increase in eCooking led to a corresponding fall in cooking with fossil fuels. In South Lalitpur, LPG use fell from 73% to 50% of cooking events (a 32% reduction), while in Solukhumbu firewood use dropped from 82% to 47%. The latter represents a huge 43% decrease, which is critical given the indoor air pollution from cooking with biomass is responsible for 24,000 deaths in Nepal per year.

LOW EPC POWER CONSUMPTION UNLOCKS ECOOKING ACCESS

Results from the energy monitoring of EPCs highlighted another crucial benefit of the technology: EPCs have far less impact on the grid than other eCooking stoves as they do not draw power continuously once they reach pressure. For instance, a grid which may only have a capacity for 10 x 1 kW hot plates should be able to accommodate more than 30 x 1 kW EPCs. This attribute is particularly important for weaker grids or off-grid systems and enabled the project to add an additional 80 EPCs in South Lalitpur (grid) and 20 in Solukhumbu (off-grid) as part of the project's market rollout.

INCREASING UPTAKE: TWO ECOOKING STOVES THE KEY

During the pilot, the menu changed little, reinforcing findings from previous studies that eCooking fits Nepali cooking practices. Households liked the EPC's simplicity and that it didn't need to be monitored, enabling people to carry out other tasks and cook other dishes simultaneously. These benefits also have potential wider social impacts as one participant highlighted:

"My Old mother has learned to cook rice in EPC by herself now. She is empowered in a way. Cooking is faster now".

IF HOUSEHOLDS HAD TWO ECOOKING DEVICES, THEY WOULD COOK THE MAJORITY OF THEIR FOOD ON ELECTRICITY

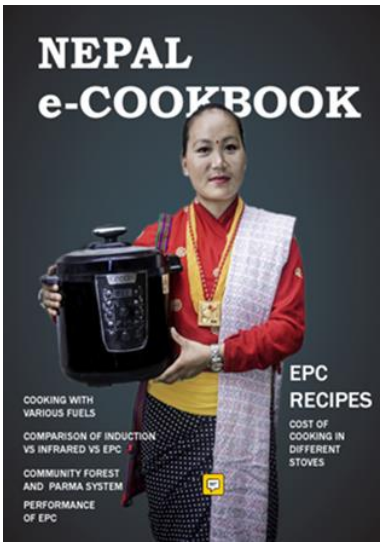


Figure 15. The Nepal eCookbook raises awareness of the health, social and cost saving benefits of eCooking compared to LPG and firewood

INCREASING ECOOKING UPTAKE: POWER SUPPLY AND AFTER SALES SERVICES

In order to expand eCooking further, a more reliable power supply and local after sales services are required. Electricity supply issues were frequent at both sites (notably during the monsoon season) causing households to revert to their previous stoves, while 27 EPCs required maintenance due to insect infestation, malfunction, or accidental damage. To ensure consumers do not lose confidence in the technology, local repair and maintenance solutions are needed which should, in turn, create economic opportunities. Improving supply chains would also help consumer confidence by allowing durable, good quality products to be more consistently available and establish a reputation. Cost is also frequently perceived as a barrier despite EPCs offering significant savings against LPG and firewood (Table 4). For firewood, equivalent labour costs for collecting wood were used, although convincing customers and policy makers of this benefit can be challenging.

Table 4. Transition costs to electric cooking with EPC

	Annual costs			
Energy Source	**South Lalitpur (Grid)**		**Solukhumbu (off-grid)**	
	Before	After	Before	After
Wood	N/A*	N/A*	13000	6500
LPG	6200	4133	6500	6000
Electricity	0	1566	0	1253
Total	6200	5699	19500	13753
Savings with electricity	501*		5747	
* Wood data was unable to be collected from the households, so the saving is likely to be higher.				

NEXT STEPS

The findings from this project further strengthen the evidence base for eCooking in Nepal by showing how the low power demand of EPCs can enable a greater number of people to access eCooking even in off-grid locations or places with irregular grid supply. The project shows how EPCs are an important part of the transition to eCooking, but not the complete solution and that having two eCooking devices would lead to households mostly cooking with electricity: a more flexible device (e.g. efficient induction stoves) to compliment the no monitoring convenience and low power demand of the EPC seems the most likely scenario. To realise this potential, policy makers and utility providers need to build a more reliable electricity supply, while a more decentralised supply chain and after sales services is also urgently required. In addition, to enable more equitable transitions to eCooking which are inclusive of lower income households, more trials at different price points are needed to better understand people's purchasing capacity for an EPC and whether different financing mechanisms (e.g. PAYGO) might address potential upfront cost barriers.

For more information on the study, the PEEDA ECO final report is available on the MECS website.

PRACTICAL ACTION CONSULTING: NEPAL PILOT STUDY

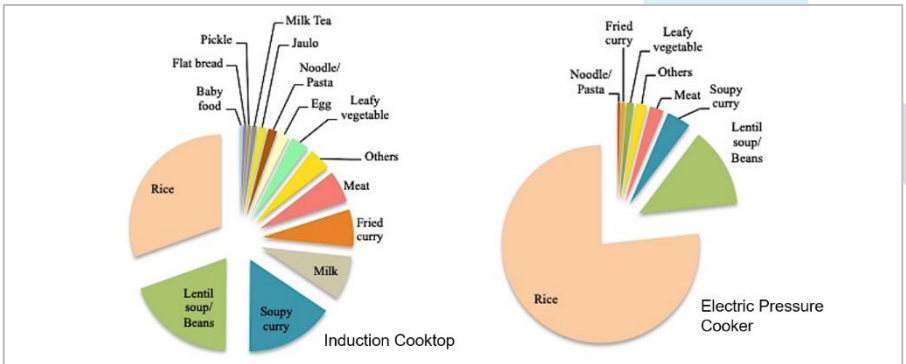
Examining viability and acceptance of electric cooking in community managed grids in rural Nepal

MECS Modern Energy Cooking Services

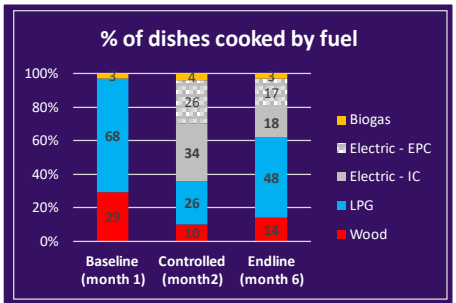
Image credit: Image, top: N.J. Mirkovic, Unsplash.

Practical Action Consulting's ECO pilot study highlighted how people in rural areas will consistently cook with electricity, supporting the economic viability of community-based electrification entities. 44 households in Mangaltar village (Kavrepalanchowk district) participated in the six-month pilot which aimed to assess the suitability of electric cooking for local menus and cooking preferences. The project was conducted by the international development organisation, PAC, with project partners: Ajummery Bikas Foundation (ABF); and National Association of Community Electricity Users-Nepal (NACEUN) and knowledge partner Access to Energy Institute (A2EI).

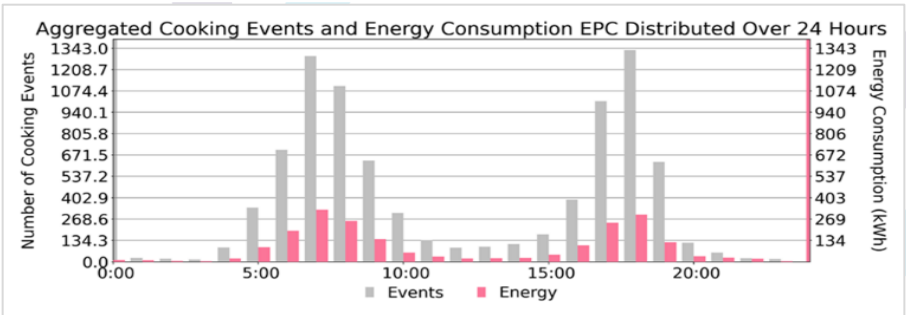
Key Facts
Location: Mangaltar Village (Kavrepalanchowk District)
Partners: ABF, NACEUN, A2EI
Pilot size: 44 households



The **IC (left)** was used to cook a greater variety of dishes than the **EPC (right)**, which offered greater cost savings. **Households with both devices used the two together regularly. They liked how the EPC did not need to be monitored, allowing the IC to be simultaneously used to cook dishes requiring attention.**



eCooker use was significant. The percentage of dishes cooked with electricity **increased from 0% (baseline) to 35% (month 6) and 60% when electricity costs were covered**



eCooking coincided with existing morning and evening peak demand for grid electricity.

CONCLUSION

The large eCooking uptake shows the clear benefits of an integrated electricity/clean cooking approach and **the key role community scale electricity systems and entities can play expanding the outreach of electric cooking in rural areas.**

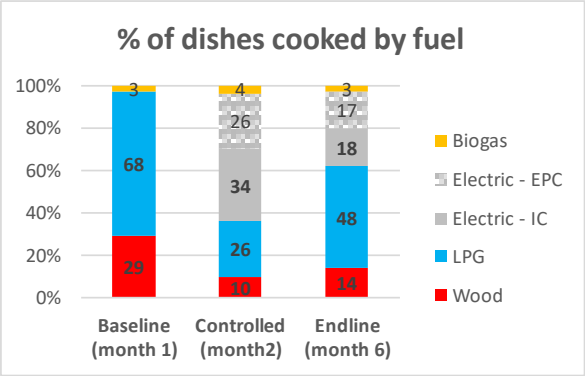


Figure 16. % of dishes cooked per fuel by phase

COMMUNITY-BASED RURAL ELECTRIFICATION ENTITES

The community in Mangaltar was electrified via a community-based rural electrification entity (CREE). CREEs play a pivotal role in grid electricity outreach in Nepal by buying electricity from the state utility and then managing distribution and retail to remote areas. The project aimed to better understand how eCooking might aid the economic viability of CREEs by providing an additional load and revenue stream, while also transitioning households away from cooking with polluting fuels.

SUSTAINED ECOOKING UPTAKE REPLACES FOSSIL FUELS

During the pilot, 14 households were provided with electric induction cookers (ICs), 15 with electric pressure cookers (EPCs) and 15 received both devices, with usage monitored via cooking diaries, smart meters, dataloggers and surveys. After introducing e-cooking solutions, Figure 16 shows they were used immediately during the controlled phase. The usage of eCooking devices rose from 0% of cooking events in the baseline phase (month 1) to 60% in the controlled phase (month 2). Electricity costs for cooking were covered in the controlled phase to encourage as much eCooking as possible and assess the impacts of tariff incentives on cooking behaviour.

Following the removal of these incentives, eCooking fell by almost half to a still sizeable 35% of cooking events. This level of use was sustained over the remaining four months of the pilot and post-pilot, highlighting that people will consistently choose to cook with electricity without tariff support and that incentives can encourage even greater use of eCooking.

The increase in eCooking led to a corresponding fall in cooking with fossil fuels. Between the baseline and endline phases, LPG use fell from 68% to 48% of cooking events (a 30% decrease), while firewood use fell by just over half from 29% to 14%. Although fuel stacking seems set to continue (partly because firewood is locally available almost free of cost to members of community managed forests), the introduction of eCooking increased the number of clean stackers (using combinations of electric, LPG or biogas) from two households in the baseline phase to 19 in the endline phase.

THE INTRODUCTION OF ECOOKING SAW LPG USE REDUCE BY 30% AND FIREWOOD BY 50%

CLEAR DEMAND FOR MULTIPLE ECOOKING STOVES

The menu changed little during the pilot, indicating eCooking fits cooking practices. Households liked both eCooking devices, with time saving the main benefit emphasised. The IC was used to cook a greater variety of dishes than the EPC which was used mainly for rice and beans/lentil soup. The range of dishes cooked on both appliances declined as the pilot progressed.

Interestingly, the households with both an EPC and IC consistently used both together, resulting in far greater eCooking usage (3.5 daily eCooking events compared to 2 for households with one device). These participants liked how the EPC did not need to be monitored, allowing the IC to be simultaneously used to cook dishes which required attention (e.g., frying/caramelising onions or sauteing vegetables). This key finding shows more than one eCooking device is likely needed to reduce stacking of polluting fuels.

LOCAL AFTER SALES SERVICES KEY TO INCREASE UPTAKE

To expand eCooking further, addressing the lack of hassle-free and swift after sales services is critical. Post-purchase behaviour reinforcement support during the project proved vital for encouraging greater use of eCooking devices. Without this support, the mostly female cooks were hesitant to experiment with eCooking for fear of being unable to provide meals for the household – reflecting household gender dynamics. This support seems difficult to replicate on a larger scale and suggests user-centred peer-to-peer learning schemes will be important for scaled eCooking. Ensuring product quality – not only for appliances but also auxiliary products such as induction base utensils for ICs and household electric wiring capable of withstanding eCooking loads – is also crucial to maintain user confidence and promote sustained use of ecooking.

Similarly, support is required from specialist agencies to exploit eCooking opportunities with other CREEs. A multi-staged CREE identification process and ongoing CREE engagement by project partners were key to the success of this project. Notably, datalogger data highlighted the consumption patterns and financial sustainability of eCooking, which led the CREE to upgrade distribution infrastructure to support the increased eCooking.

Lastly, a more decentralised supply chain is urgently required to cater for repair and maintenance in rural areas. Several devices experienced technical faults during the pilot and needed to be sent to Kathmandu for repair. With Mangaltar over 60km from the capital, this distance was a major concern for participants (especially post-pilot) and local service centres are needed to increase consumer confidence in eCooking. In Mangaltar, the situation was helped by a CREE staff member with IC maintenance training. Similar training for other CREEs or local bodies may help address these issues in other rural locations.

NEXT STEPS

The successful integration of ICs and EPCs in Mangaltar adds further weight to the existing evidence base for eCooking in Nepal. The sustained uptake in rural households demonstrates how eCooking can be critical to supporting the economic viability of CREEs by providing an additional load and revenue stream, which, in turn, facilitates electrification and clean cooking outreach to last mile locations. This clearly highlights the synergies to be gained by integrated electrification and clean cooking planning – an overarching aim of the MECS programme. Given the clear and increasing demand for eCooking in Nepal and the need for a more reliable electricity supply to accommodate this load, adopting an integrated approach at larger scales is critical if government targets for 25% of households to use electricity as their primary cooking fuel are to be met.

For more information on this study, the PAC/ABF/NACEUN ECO final report is available on the MECS website.

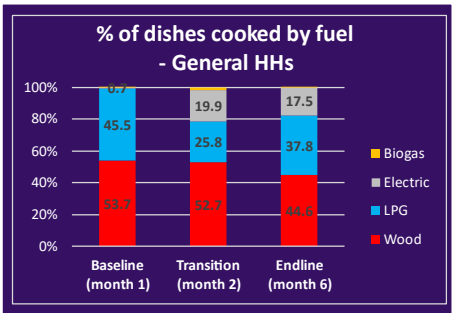
WINROCK: NEPAL PILOT STUDY

Efficient Electric Cooking Market Uptake in Nepal (EECMU): determining consumer willingness to pay and acceptability of EPCs in Nepal.

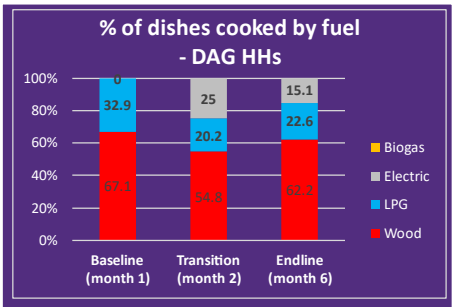
Image credit: Winrock International, 2021

While transitions to electric cooking in more affluent and urban Nepali communities have been documented, Winrock's ECO pilot study has demonstrated clear uptake by low-income peri-urban households – even those which collect firewood for free. 50 households in Katahariya Municipality (Rautahat District) participated in the six month pilot which assessed whether electric pressure cookers (EPCs) were compatible with consumer preferences and the local electricity infrastructure. The study was conducted by the non-profit organisation, Winrock International, with project partner, the Renewable Energy, Water Supply and Sanitation Promotion Centre (REWSSPC).

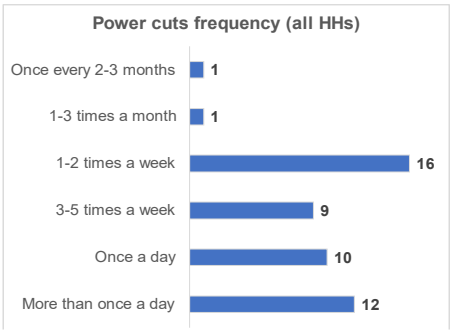
Key Facts
Location: Katahariya Municipality (Rautahat District)
Partners: REWSSPC
Pilot size: 50 households (HHs)



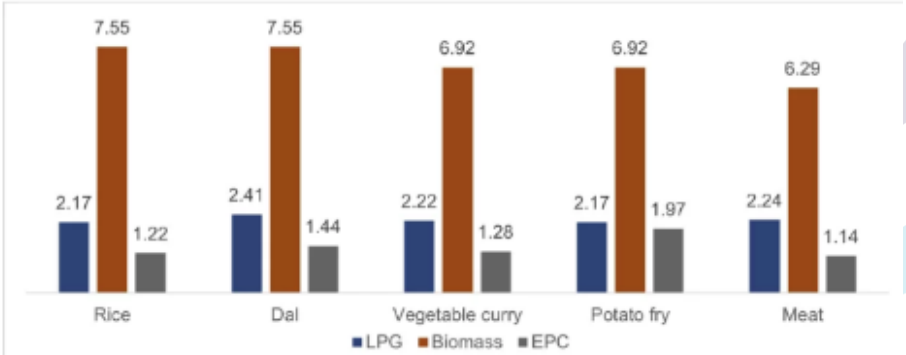
eCooker use was sizeable among the general HHs. The percentage of dishes cooked with electricity **increased from 0.7% (baseline) to 17.5% (month 6)**



eCooker use was more varied among the DAG HHs, **rising from 0% (baseline) to 25% (month 2) but falling to 15% by month 6** due largely to the **lack of local repair centres**



Electricity supply reliability is an issue and meant housholds could not use the appliances as much as they wanted to.



EPC cooking costs were over five times cheaper than purchased firewood and approximately half those of LPG.

CONCLUSION

EPC uptake and use was sizeable, including among the low-income households. **To expand eCooking further, improved access to local service centres to cater for last mile repair and maintnenace is urgently required.**

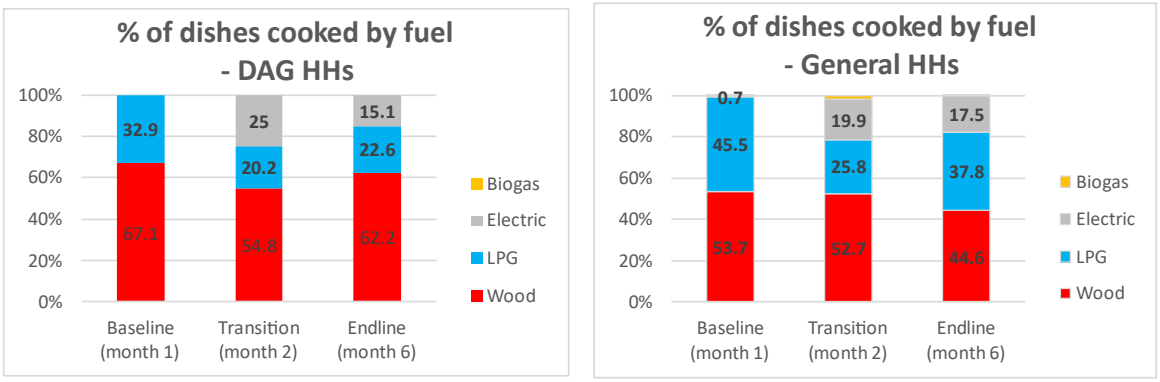


Figure 17-18. % of dishes cooked per fuel by phase in DAG households (left) and general households (right)

SIZEABLE ECOOKING UPTAKE MAINLY REPLACES LPG

During the pilot, subsidized EPCs were distributed to the 50 households, with usage monitored through cooking diaries, energy meters and surveys. 20 households from disadvantaged groups (DAG HHs) – either ethnic minorities or economically poor – were included to see how eCooking preferences and uptake compared with 30 non-disadvantaged or 'general' households.

Once introduced in the transition phase (month 2), EPC use was sizeable and consistent in both groups. eCooking events increased from 0% to 25% in DAG households and from 0.7% to 20% in General households (Figures 17-18). After the transition phase, this share fell to a sustained 34% across both groups for the rest of the pilot, with EPCs accounting for 15% (DAG) and 17.5% (General) of cooking events in the endline phase (two weeks, month 6). The reduced use was primarily due to the lack of local service centres to repair EPC faults. The endline phase also coincided with a festival season where quantities of food were cooked that were beyond the capacity of the EPC, while firewood use increased in the last two (colder) weeks as some cooked with the fuel to heat their homes.

The uptake in eCooking saw LPG use fall from 33% to 23% of cooking events in DAG households and from 46% to 38% in general households, representing a 30% and 17% decrease respectively. Biomass use fell from 67% to 62% (DAG) and from 54% to 47% of cooking events (General). Replacing more firewood proved challenging as it is mostly collected (i.e., free) in the community. Electricity + firewood emerged as a common fuel stack, used consistently for 20% (DAG) and 15% (General) of meals. These findings suggest EPCs are likely to substitute the use of LPG more than firewood but are unlikely to completely replace other fuels.

EPCS PROVE A GOOD FIT FOR LOCAL COOKING PRACTICES

The foods people cooked changed little during the pilot, indicating eCooking suits the local cooking culture. Households particularly liked the EPCs for their ease of use, faster cooking times, and the taste of the food. The safety and cost savings of EPCs were also widely appreciated. EPC cooking costs were over five times cheaper than purchased firewood and approximately half those of LPG. These positive experiences resulted in almost all participants stating they would continue using the EPC post-pilot, while 50% indicated they would pay the retail price for a device (although disconnects between surveyed preference and reality are common).

ESTABLISHING LOCAL SERVICE CENTRES IS URGENTLY NEEDED TO INCREASE COMMUNITY CONFIDENCE IN ECOOKING

Figure 19. Collecting feedback during the exit survey (image credit: Winrock International, 2021).

EPCs were mainly used to cook rice and lentils with the lack of adjustable heat control (to speed up cooking) preventing some from preparing other dishes. The size of the EPC inner pot also limited use for larger households and 50% of participants requested an extra pot to cook multiple dishes without needing to empty the pot first. Whether an additional pot would encourage eCooking remains uncertain as the participants' consistent use of double burners (stoves) over firewood or LPG (and sometimes firewood with LPG) suggests simultaneous, rather than consecutive, cooking of dishes may be preferred.

LOCAL SERVICE CENTRES: THE KEY TO INCREASING UPTAKE

To expand eCooking uptake, more reliable electricity and improved home wiring are required. Frequent power outages caused participants to revert to LPG or wood, while all households required wiring upgrades to enable eCooking adoption. Upgrading meter connections could also facilitate increased use. While the participants' 5 ampere connections proved sufficient for EPCs which do not draw continuous power (a key advantage for weaker grid infrastructure), 15-amp connections are required to run other eCooking devices or multiple appliances simultaneously.

However, more pressing is the need to establish local service centres to cater for last mile repair and maintenance. During the pilot, five devices experienced technical issues and needed to be returned to Kathmandu for repairs under the warranty. Being poorly connected to the capital, the turnaround was lengthy (2-3 weeks) which undermined confidence in eCooking among participant who feared repairs would not be possible or challenging (especially post-pilot). These concerns were the main factor behind the reduction in EPC use and potential scope for the more widespread electric rice cooker supply chain to provide EPC after sale services need to be explored.

NEXT STEPS

The positive reception and use of the EPCs by DAG households further strengthens the existing body of evidence for eCooking in Nepal by clearly showing low-income households will choose to cook on electricity if appliances are made available. At this stage, the results show that the EPC enables a part transition to eCooking. To enable a greater shift, further research is required into how credit facilities might allow eCooking devices to be more competitively priced while local service centres are urgently needed to increase household confidence in the technology. This need for decentralised after sales services reinforces the importance of the 'jigsaw concept' at the heart of each MECS country level theory of change which highlights how all pieces of the (location specific) puzzle need to be in place to enable scaled uptake of eCooking.

For more information on this study, the Winrock ECO final report is available on the MECS website.

Featured image, top: Participant cooking vegetable curry on an EPC. The image was taken during the shoot of the video documentary 'Cooking at Ease' created for the project (image credit: Winrock International, 2021).

CONCLUSION

By showing that people are willing to use and pay for electric cooking on a sustained basis, this report serves as a call for government and non-government institutions to be far more dynamic in advocating for and scaling electric cooking and demonstrates the clear opportunities for organisations (both state and private sector) to expand their operations and place far larger orders of efficient electric cooking appliances (EECAs). The seven pilot studies all illustrate in a range of socio-economic and cultural contexts that when EECAs are made available, uptake is swift, significant and sustained. In Nepal, the huge potential for scaled eCooking is further demonstrated by the consumer demand, supply chain opportunities and favourable enabling environment identified by the ECO market assessment.

The clear opportunities to scale eCooking can be fast-tracked if key barriers (which cut across the different ECO projects and contexts) are addressed. The report therefore concludes with a call for action, highlighting the principal measures required for unlocking this potential to support electric cooking at scale.

1. Improve access to local financing and flexible payment mechanisms to enable low-income households to purchase EECAs. More novel forms of finance (e.g., carbon financing, smart subsidies) along with increased awareness raising programmes could also help reach these most-in-need households.
2. Increase efforts to address grid supply and reliability issues which undermine consumer confidence in eCooking and prevent housholds from using EECAs as much as they would like to. Demand side management measures – including promoting highly efficient appliances such as EPCs – will be key as eCooking coincided with peak demand in each study.
3. Establish more decentralised after sales services to cater for last mile EECA repair and maintenance. Local services centres are urgently needed to ensure consumers do not lose confidence in the technology and return to traditional stoves, and should, in turn, create economic opportunities.
4. Leverage and strengthen local organisations to provide key activities along the eCooking supply chain such as sales, after sales services, and awareness raising. The ECO projects have shown particular opportunities for local women's cooperatives (Geres, IRADe),community based electricity providers (PAC), and organisations from other sectors whose existing sales and distribution network can be piggybacked on (iDE).
5. Improve supply chains to enable durable, good quality products to be more consistently available at the local level.
6. Develop mechanisms to certify and/or upgrade household wiring and meter connections to handle eCooking loads. For example, checks could be efficiently carried out by distribution licence holders when connecting households to the grid or installing meter upgrades.
7. For Nepal, the ECO market assessment emphasised the need to revise electricity tariffs, develop a national clean cooking strategy to coordinate planning, investment, and stakeholders, and provide incentives to encourage private sector eCooking investment.

These recommendations reinforce the importance of the 'jigsaw of pieces' concept at the heart of the MECS country level theory of change, where all pieces need to be in place to enable scaled uptake of eCooking. Drawing on the learnings from the ECO projects, the MECS programme is supporting strategic interventions in each of the contexts in this report (as well as many more) to target the gaps identified in each country jigsaw, thereby facilitating the clear opportunities for scaling up eCooking, accelerating transitions away from cooking on solid fuels, and contributing signifcantly to climate targets such as the Sustainable Development Goals and Nationally Determined Contributions.

THE ECO PROJECTS CLEARLY SHOW THE TIME IS RIGHT FOR FAR MORE DYNAMIC AND AMBITIOUS SCALE UP OF ELECTRIC COOKING

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