# Paying people carbon credits based on usage data

## ATEC eCook Cook-to-Earn Case Study

Modern Energy Cooking Services Programme
Cambodia and Bangladesh

**July 2023**

Disclaimer:

The Modern Energy Cooking Programme (MECS) is funded by UKAid through the Foreign, Commonwealth and Development Office*. It is a partnership between researchers, innovators, and policy makers, drawing on their expertise and relevant work from around the world to co-construct new knowledge with practitioners and the private sector. It is led by Loughborough University, UK in partnership with ESMAP. Further details can be found at www.mecs.org.uk.

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# EXECUTIVE SUMMARY

## Project context

ATEC, a global leader in electric cookstoves and carbon markets, conducted the Cook-to-Earn (C2E) Pilot Project with customers in Bangladesh and Cambodia to research the behavioural change impact of carbon credit-linked micropayments based on verifiable usage. The project focused on observing unbiased and at arms-length the behavioural impact of mobile money micropayments on usage - made possible through ATEC's proprietary eCook stove with in-built Internet of Things (IoT) cooking usage data collected remotely. Digital monitoring played a crucial role in the project, with individual weekly usage and earnings tracked on a dashboard and communicated to sample customers through an app and SMS.



## Key findings

The study concluded that a direct micropayment of carbon finance linked to usage levels increases usage of electric cooking as the primary cooking device and this can be verified at arms-length via usage data.

**Key findings from the project included:**

- **Micropayments drive usage in new customers:** Study participants who were new customers from day 1 of the study showed the highest increase in usage, ranging from 38% to 56%, compared to the control group.
- **Micropayments also alter existing customer usage:** Signing existing customers into the study led to an increase in usage ranging from 1% to 21% compared to their prior non-incentivized usage, but less than new customers.
- **Communicating the benefit is key:** The project pilot, tested and validated interventions to support customers to adopt C2E with notable improvements once implemented.
- **Micropayments is only one way to incentivise usage:** Micropayments require the customers to understand the mechanism and quantify the value they're receiving. Deeper dives into the effective rollout of micropayments, as well as alternatives to micropayments for how carbon revenues can be shared, require further investigation.
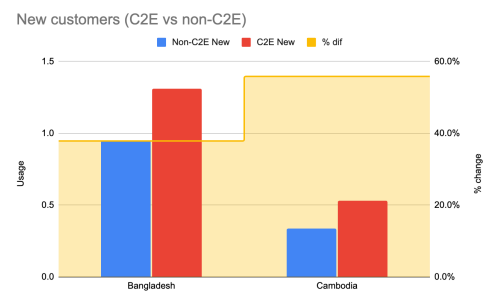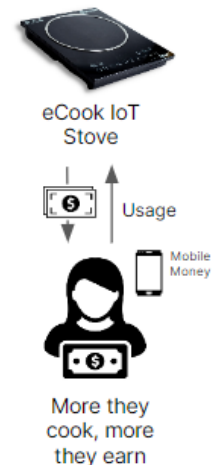
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|---|---|
| **FCDO Project Name:** | Modern Energy Cooking Services Programme |
| **FCDO Project Number:** | 300123-101<br>RC0000332 |
| **Goal:** | Development of Minimum Viable Product (MVP) - demonstrating that paying people carbon credits to cook will increase stove usage - driving higher product adoption and carbon credits per stove. |
| **Project timeframe:** | 12 September 2022- 31 December 2024 |
| **Target Reach:** | 2 countries with a variety of sample customers piloted |
| **Key Messages:** | Increase usage through a direct payment of carbon finance based on their verified usage data |

# 1. Project Summary and Contextual Analysis

# 1.1 Contextual analysis

## Statement of problem

Access to clean and modern cooking solutions is required for 4 billion people, costing the global economy $2.4 trillion per year plus contributing 2% of global carbon emissions (World Bank, 2020) for using wood and coals as cooking fuel and causing multiple health issues for women from Particulate Matter (PM) 2.5 emissions exposure. At households earning <$10/day (Base of Pyramid, BoP), 1.5 days per month are spent on collecting wood while 3 hours per day are spent on household chores due to inefficient cooking.The costing of the conventional cooking method is equivalent to the national GDP of Italy.

**Cambodians and Bangladeshis predominantly cook with biomass**

In Cambodia, around 67% of households rely on biomass for cooking, contributing significantly to carbon emissions. Gas (60% butane, 40% LPG) is used by 31% of households, adding to the overall carbon footprint.

Similarly, in Bangladesh, the majority of people (about 74%) in rural areas still use traditional biomass stoves for cooking. In urban areas, gas stoves are more popular, used by nearly 24% of the population. Electric cooking is only chosen by 1% of people, both in rural and urban areas.

Usually, 85% of non-renewable wood consumption is dedicated to domestic cooking, leading to deforestation and releasing a significant gigaton of black carbon emissions annually. These emissions hinder the progress towards achieving SDG 13 (Sustainable Development Goal 13 on climate action). By 2030, this situation will leave around 2.2 billion underserved people without access to modern clean energy and technology.

Moreover, women, who are traditionally responsible for food security, face risks of burns from cooking with traditional fuels and encounter gender-based violence during fuelwood collection. The lack of conflict management processes in cooking energy further exacerbates these challenges.

**Solving clean cooking deserves extra attention and resources**

Founded in 2016, ATEC  is a social enterprise that offers clean cooking solutions featuring affordable, accessible, and modern technology through its Flywheel approach. As an integral part of the Impact Flywheel approach, ATEC employs the "Cook-to-Earn" strategy to encourage widespread adoption of their patented eCook induction stove. This involves paying people carbon credits based on their usage data when using ATEC's eCook induction stoves.

The Cook-to-Earn approach incentivizes users to adopt and continue using the eCook induction stove, as they can earn financial rewards through carbon credits for their sustainable cooking practices. By integrating financial incentives with the eCook induction stove, ATEC aims to create a self-reinforcing cycle that fosters greater adoption and momentum in the market.



Clean cooking is also an overlooked and underfunded socio-environmental problem which requires sustainable technology with continuous research and development and multi stakeholder partnership and finance to scale up to solve the issue within 2030 and will cause unfulfillment of SDG 7 for clean energy and SDG 17 for inclusive partnerships. Solving clean cooking with improved technology will reduce carbon emissions that will convert to carbon credits resulting in a key driver in overcoming affordability as well as climate change. Lack of data and analytics around black carbon emission from cooking makes gauging SDG 7 difficult.  The metrics are key to evidence-based policies and investments to make the technology affordable.

Efficiency levels for cook stoves vary widely, with biomass-based improved cook stoves having an efficiency of 25-35%, gas stoves achieving 30-40% efficiency, and electric cooking appliances being the most efficient at 60-90%. Biomass-based cook stoves pose environmental and health concerns due to higher greenhouse gas
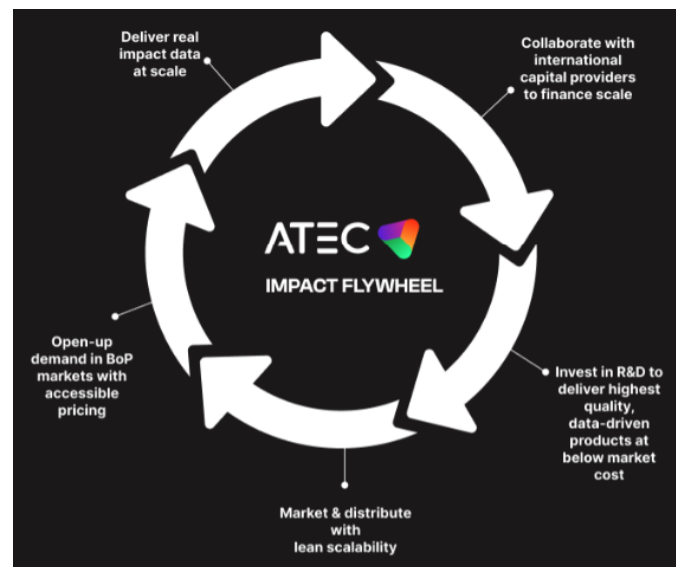
emissions and poorer kitchen hygiene. Respiratory and vision-related ailments are common among those using these stoves. Gas burners produce fewer greenhouse gas emissions and offer better kitchen hygiene, but there are still issues with carbon monoxide emissions inside the kitchen.

Electric cooking is the cleanest option for kitchen hygiene and environment, with an overall efficiency of around 38% when considering power generation and cookstove efficiency.

# 1.2 Cook-to-Earn approach as catalyst towards uptaking usage

ATEC's theory is that the BoP cooking sector is over time evolving through 3 stages made possible by advances in carbon credit markets and stoves towards IoT and data-driven automation.
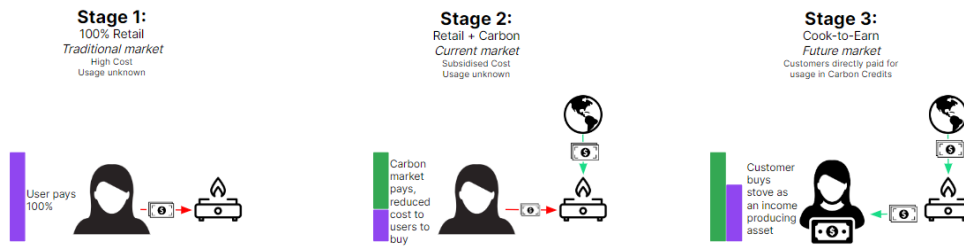


| Stages | Status | Features | Payment Model |
|---|---|---|---|
| **Stage 1**: 100% Retail | Traditional market | High Cost Usage unknown | User pays 100% |
| **Stage 2**: Retail + Carbon | Current market | Subsidised Cost Usage unknown | Carbon market pays, reduced cost to users to buy |
| **Stage 3**: Cook-to-Earn | Future market | Customers directly paid for usage in Carbon Credits | Customer buys stove as an income producing asset |

Paying people carbon credits directly for their cooking choices changes cooking from a consumptive cost into a productive asset - a psychological switch that ATEC wants to investigate on if it will lead to mass uptake of modern cooking.

The Cook-to-Earn approach can be a powerful catalyst in accelerating the uptake of product or service usage. By offering incentivized cooking rewards, this innovative strategy has the potential to motivate and engage users,

leading to increased adoption rates. The concept empowers customers by linking their daily cooking activities to tangible benefits, whether through financial rewards or other valuable incentives. This connection creates a sense of ownership and encourages active participation, thereby fostering a positive user experience. As a result, the Cook-to-Earn model not only drives usage but also nurtures a loyal customer base, reinforcing the potential for long-term sustainability and positive impact on various socio-economic goals.

ATEC's ways of solving clean cooking and climate change are through enabling disruptive technology affordable and delivering knowledge and technology to the last miles. ATEC's patented eCook is the world's first paygo induction stove bringing together paygo, Global System for Mobile Communications (GSM) and Internet of Things (IoT) functionality that makes mobile money payments easy for unbanked underserved population and provides real-time user information. Users need to pay as low as $5-$10 per month on an instalment plan for 27 months.

Having the highest rating of all cooking solutions on the Energy Sector Management Assistance Program (ESMAP) 5-Tier scale, ATEC's eCook is considered as the safest and easiest cooking solution. Features around one-touch cooking, instant heat, no flames, no potential explosions, the ability to be turned off remotely and 92% efficiency rating are the winning baits ATEC presents to replace with conventional cooking methods.
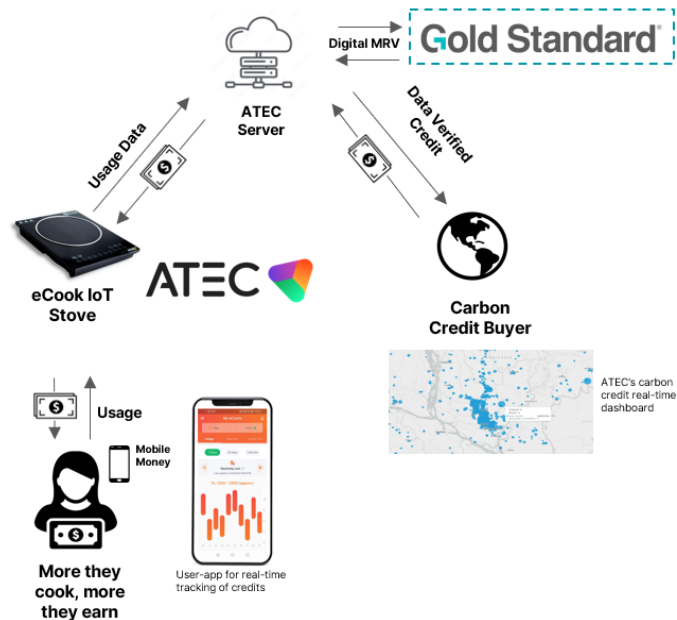


ATEC leverages Carbon Credit generation and climate finance acceleration as a core strategy to reduce costs and facilitate technology adoption for underserved communities. Real-time user data validates emission reductions and generates carbon credits on a larger scale. These credits become part of ATEC's Impact Flywheel, empowering Base of Pyramid (BoP) Households with cook-to-earn rewards. By offsetting stove costs with carbon credit revenue, ATEC accelerates uptake, fostering greater adoption of clean cooking solutions and driving increased financing for sustainable initiatives.

In Bangladesh and Cambodia, a significant portion of the population predominantly relies on biomass, such as firewood and charcoal, for their cooking needs. However, this traditional cooking practice poses numerous challenges, ranging from health and environmental hazards to financial constraints. As a result, there is a pressing

need to introduce a transformative approach like Cook-to-Earn to address these issues and drive a transition towards cleaner and more sustainable cooking solutions.

Firstly, the heavy dependence on biomass for cooking leads to indoor air pollution and deforestation, adversely impacting public health and the environment. The Cook-to-Earn model encourages the adoption of modern and cleaner cooking technologies, reducing indoor air pollution and mitigating deforestation by minimising the reliance on biomass.

Secondly, many households in these countries face financial limitations that hinder them from adopting cleaner cooking options. Cook-to-Earn addresses this barrier by incentivizing users through rewards or incentives, making cleaner cooking technologies more accessible and affordable for underserved communities. Moreover, the Cook-to-Earn approach fosters behavioural change by offering tangible benefits for cooking with clean technologies. By linking daily cooking activities to rewards, users are motivated to embrace and sustain the shift towards cleaner practices, promoting a positive and lasting impact on their cooking behaviour.



Furthermore, Cook-to-Earn empowers individuals and families, especially women, by providing opportunities for economic improvement. Earning rewards through cooking not only enhances their economic well-being but also contributes to poverty reduction and economic development within the community. Additionally, the approach aligns with global climate objectives by generating carbon credits through emission reductions. By encouraging the uptake of cleaner cooking solutions, Cook-to-Earn contributes to efforts aimed at reducing carbon emissions and combating climate change.

Lastly, the successful implementation of Cook-to-Earn drives market demand for clean cooking technologies, promoting innovation and investment in the sector. This transformative shift can lead to long-term market transformation and foster economic growth and sustainability.

# 2. Research Methodology

# 2.1 Study Participants Selection

The research methodology employed a purposive sampling technique to select pilot customers from two countries, Bangladesh and Cambodia, where ATEC operates. A total of 80 customers were chosen from each country, representing a diverse mix of new and existing customers who had signed up for ATEC's eCook services. The sample included customers using ATEC's magnetic induction stoves with IoT technology for daily usage tracking, with both single (2000W burner) and double (2×1000W burners) stove configurations considered.

To ensure comprehensive representation, the sample encompassed two distinct customer categories: Leap Froggers, who directly shifted from traditional cooking with charcoal/wood to induction cooking, and Transitioners, who made the transition from LPG cooking to induction cooking. The gradual sign-up process extended over several weeks, starting in January and continuing through June, allowing for a thorough observation of usage patterns and trends over an extended period.

At the midway point of the project, a half-time check-in was conducted, involving communication with 20 customers per country. This check-in aimed to assess the customers' knowledge, awareness, and understanding of the Cook-to-Earn (C2E) concept. The insights gained from this check-in facilitated a deeper understanding of usage patterns and identified potential intervention needs.

The purposive sampling approach enabled the research to gather valuable and targeted data on customer behaviour and experience, forming the basis for further analysis and the development of effective strategies to encourage Cook-to-Earn adoption and usage among the target population.

# 2.2 Methodology

The project's research was structured into 3 essential phases consisting of a pre-intervention survey to establish the baseline (called Wave 1 for simplification in this report), an intervention phase with activities described further below in order to test perception changes, and a post-intervention survey (referred to as Wave 2 in this report).

1.  Sampling of pilot customers: 2 countries with a variety of sample customers piloted

2. Step 2: Customer sign-up and set-up: Low touch interaction, then observe behaviour purely through digital cooking data

3. Step 3: Rollout and ongoing customer interactions: Weekly usage and earnings updated via app and SMS

| | 2022 | A | S | O | N | D | 2023 | F | M | A | M | J | J |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | | | | | | J | | | | | | |
| **Product R&D (Hypothesis 1)** | | | | | | | | | | | | | |
| Infrastructure selection | | | | | | | | | | | | | |
| Setup data backend for long-term data storage | | | | | | | | | | | | | |
| Unit economics analysis | | | | | | | | | | | | | |
| Initial field surveying hypothesis 1&2 | | | | | | | | | | | | | |
| Build integrations for carbon to mobile money | | | | | | | | | | | | | |
| Ongoing systems & data integration for MVP | | | | | | | | | | | | | |
| Hypothesis 1 Validation: Technical feasibility | | | | | | | | | | | | | |
| **Market Testing & Validation (Hypothesis 2)** | | | | | | | | | | | | | |
| Market rollout initial pilot | | | | | | | | | | | | | |
| Review initial findings | | | | | | | | | | | | | |
| Market rollout full test group rollout | | | | | | | | | | | | | |
| Customer a/b survey | | | | | | | | | | | | | |
| Usage analysis | | | | | | | | | | | | | |
| Hypoth2 Validation: increased usage | | | | | | | | | | | | | |
| Final Report for publication | | | | | | | | | | | | | |

# 3. Project Interventions

# 3.1 Customer sign-up and set-up: Low touch interaction, then observe behaviour purely through digital cooking data

- 'Low touch' approach:
  - Sample customers contacted via phone interview explaining them that for a limited period of time they would be offered to participate in a pilot where ATEC would pay them a specified amount for each kWh of cooking they had completed
- Making impact tangible in kWh:
  - Amount set at carbon credit price achieved by ATEC at 25$/ton of avoided emission, broken down into 0.05$ for each kWh cooked
- Simple condition to participate:
  - Verbally confirm they understand approach
  - Give consensus to participate
  - Have mobile money account to receive weekly transfers
- Cooks as decision makers:
  - Participants had to be main cook in household to ensure that regular C2E transfers would be visible and accessible to the person making the actual cooking and cooking source selection decisions

# 3.2 Rollout and ongoing customer interactions: Weekly usage and earnings updated via app and SMS

- As little contact as possible:
  - After sign-up, direct contacts were avoided to not influence behaviour and research results
- Automated payment process:
  - Once a week, electronic payments were made to each customer for their past week's usage (ABA and ACLEDA eBanking accounts used in Cambodia, BKash in Bangladesh)
- Weekly digital notifications:
  - Customers received device notification via banking app when receiving money and SMS from ATEC (via Angaza) with individual weekly kWh used and weekly earnings transferred in local currency
- Native language interactions:
  - Local project managers coordinated interactions in local language with customers to ensure clear and direct communication
- Monitoring via C2E Dashboard:
  - A project dashboard was maintained to track and observe usage behaviour with daily data

# 4. Analysis of Key Project Results

# 4.1 Key Project Results

The Cook-to-Earn program has been successful in promoting the adoption and consistent usage of eCook technology. The program's emphasis on early-stage onboarding and providing incentives through C2E has led to significant changes in cooking behaviour, especially among new customers. Several key success points highlight the potential for further growth and adoption of eCook technology among ATEC's customer base:

- #1: Paying new customers for their usage gives an increase of 38 to 56%

- #2: Paying existing customers for their cooking increases usage from 1-21%

- #3: Results within the existing customer group varied significantly with reasons still be investigated and further research required

- #4: Increasing education on why and how customers can benefit from C2E payments will likely increase usage further

- #5: While cook to earn as a concept was generally confirmed, micro cash payments are only one way to drive usage: Multiple cost-neutral direct and indirect incentive schemes can be tested and may nudge usage better, faster or cheaper

**Paying new customers for their usage gives an increase between 38% and 56%**

New customers incentivized through C2E showed a significant higher usage, compared to their control group of new customers not receiving C2E incentives

- Newly signed up customers - customers who were offered to participate in C2E from day 1 of their stove ownership - showed significantly higher C2E uptake than existing customers (following chart)

- This comparison confirms the importance of focusing on early stage customer onboarding and their initial e-cooking uptake right, to set a solid base for lasting cooking behaviour change, and suggests to invest more research into identifying best practices

New customers (C2E vs non-C2E)
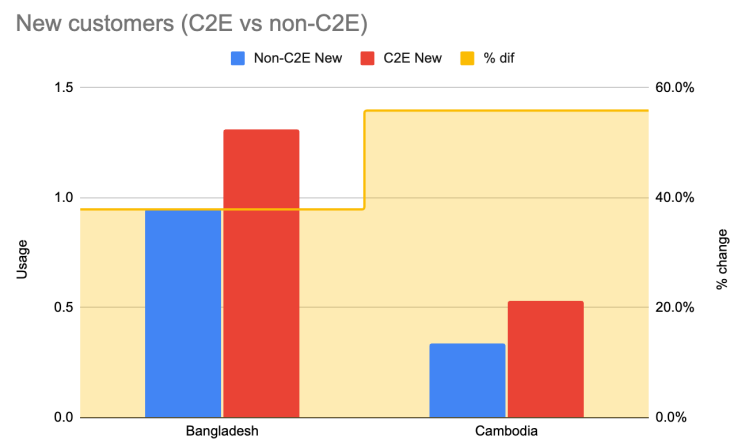
- The subsample was compared against a control group of new customers signed up in the same period of time but not taking part in the project

- The important behavioural change in this subsample is highly relevant as the steady-state C2E customers for ATEC moving forward would mainly be new customers

- * BD price per kWh: 8 taka; KH price per kWh: ranging between 410 and 730 riels, weighted average of 550 riels (June 2023

**Paying people for cooking does increase usage by 1-21% with existing customers depending on country**

- Paying people to cook increased daily usage across a 2-country sample by more than 20% vs. control groups of customers not receiving incentive

- Results across 2 countries differed: BD +21% and KH +1% for existing customers

- Amount of money paid in relation to user's local electricity costs seems a key factor to impact behavioural change:

- BD C2E incentives of 4 taka/kWh covered 50% of users' expenses* leading to a 21% usage increase

- KH C2E incentives of 200 riels/kWh covered 33% of average expenses* leading to 1% usage increase
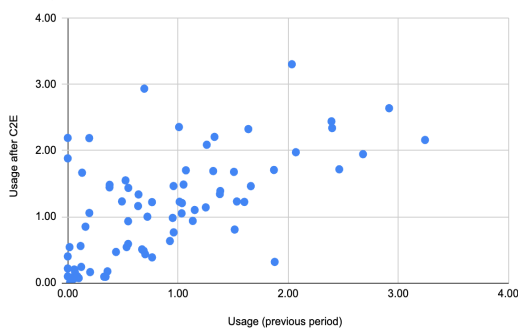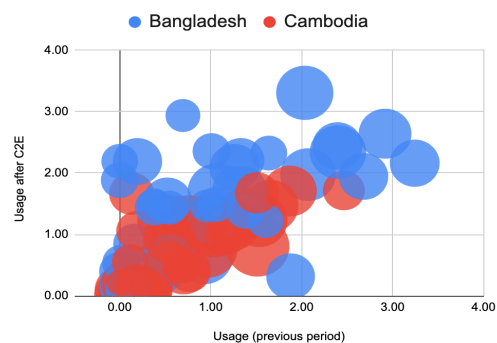


Existing customers



Existing customers
New customers in Bangladesh C2E vs Non-C2E
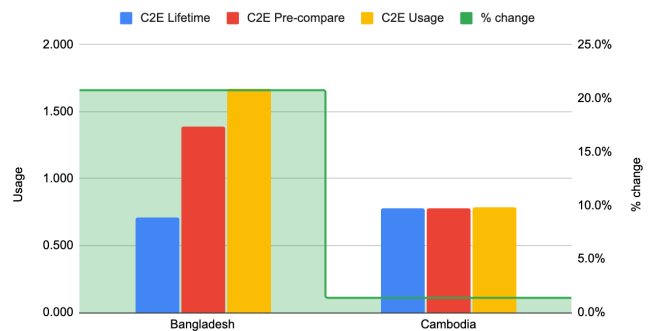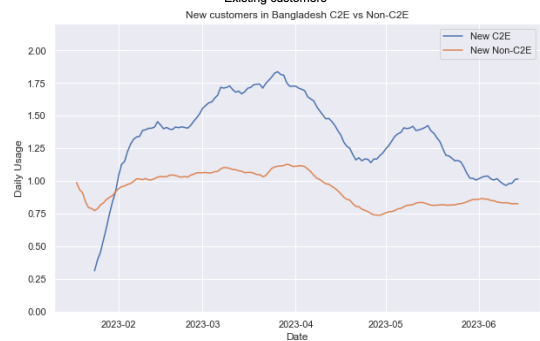


Usage before/after both countries



Usage before/after C2E by country

**Results within the group varied significantly, which is why further research is required**

- Despite the overall increase of usage through C2E, distribution of usage changes was heterogeneous: some customers reduced their usage after being paid by e.g. 50%, others increased up to 200% after receiving incentives
- Reasons behind this big spread and particular the behaviour of very high/very low users needs to be investigated further with more data
- Overall, participants as well as local staff and stakeholders were struggling to understand the concept, so a general distrust in the pilot may have led to lower uptake than it would have with full understanding
- Particularly the understanding of saving potential, e.g. supported by a user smartphone application illustrating saving effects from cooking, leave room for further exploration and best practice building

# of customers who increase/decreased usage
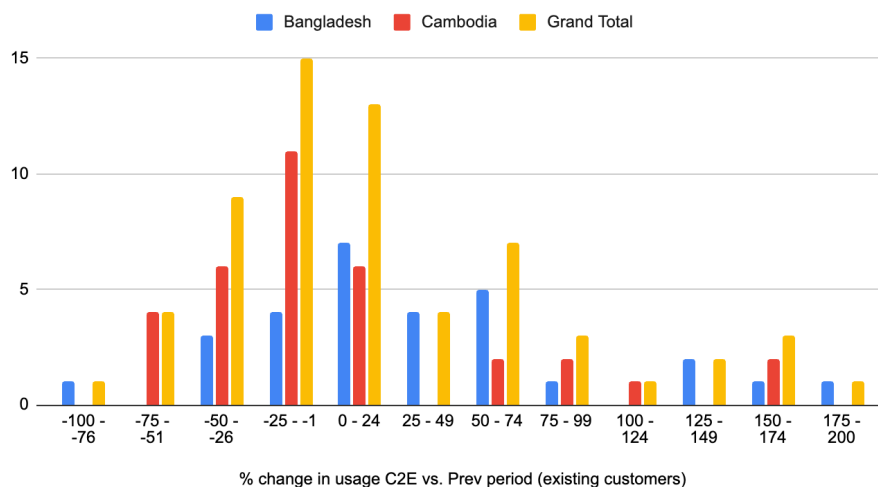


**Increasing education on why and how they can benefit from C2E payments will likely increase usage further**

- First nudges moving from low to higher touch at end of pilot show positive trends, but more data over time required
  - Nudge EDUCATE: call to train and educate to ensure understanding of C2E in general and savings potential
  - Nudge DOUBLE: Inform customers about increasing payment doubling the initial incentive, adjust next weekly payment accordingly
  - Nudge EARN: Inform customers about increasing payment to a level their electricity costs for their

cooking, adjust next weekly payment accordingly

- Testing payment sensitivity (nudges DOUBLE and EARN) will provide valuable feedback to the carbon credit community on the sweet spot of the CC $/ton price that would be significantly changing cooking behaviour globally
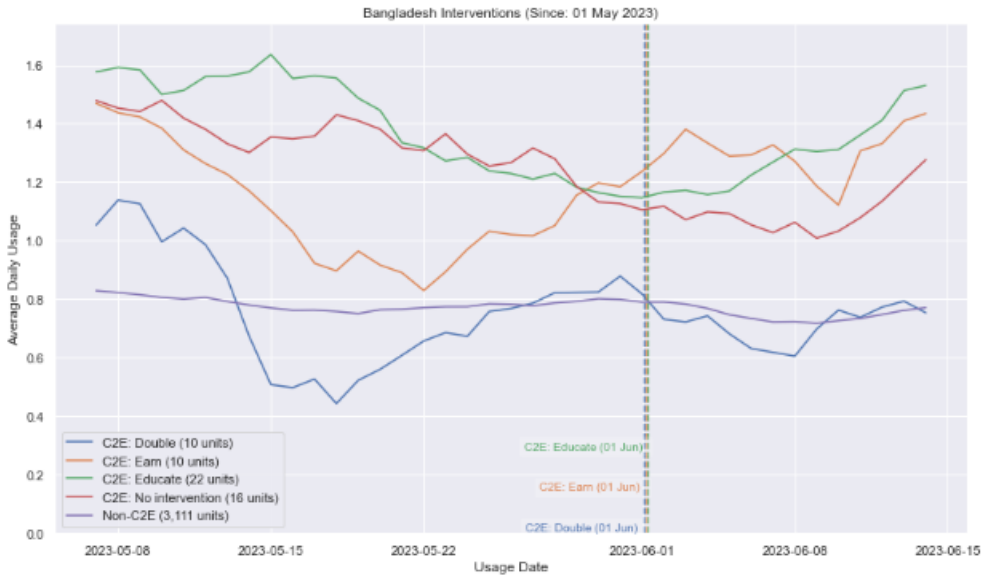


Bangladesh intervention trends, exemplary*

**While cook to earn as a concept was generally confirmed, micro cash payments are only *one* way to drive usage**

- Multiple direct and indirect incentive schemes (e.g. point collection system) have not been tested yet and may nudge usage better/faster/cheaper as well as provide interesting insights in the future

- Many interventions identified and easily testable through new testing, tagging and monitoring approach

- Pilot has solidified this ATEC-specific approach to action-research with actual live usage data rather than traditional survey-based behaviour research

- We tag people with different research criteria and either can run queries right away or start collecting data from that point on, automatically *as they use*

- IP created and systems optimised is bound to make future research projects more efficient, reduce cost and improve the results/$ ratio

# 5. Study Summary, Limitations & Next Steps

# 5.1 Summary

The research key results indicate that paying new customers for their usage increases eCook technology adoption by 38-56%, while paying existing customers increases usage by 1-21% depending on the country. However, usage variations were observed within the group, necessitating further research. Increasing education on the benefits of C2E payments is expected to enhance usage. The concept of Cook-to-Earn was confirmed, but other incentive schemes remain untested and could yield interesting insights in the future. The pilot study has established an ATEC-specific approach to action-research using live usage data, leading to improved efficiency and reduced costs for future research projects.

# 5.2 Challenges and Limitations

1.  **More data to deliver more solid results:** Sample size and duration of pilot providing good first indications but needing deeper testing with more data over a longer period of time for more solid results

2.  **Major local events may have potentially damped results:** Important holidays in both countries during the pilot period as well as electricity cuts through load shedding in Bangladesh - direct impact for users of being less able to cook and indirect impact causing more hesitant usage through negative (social) media reports on electricity issues - may have impacted usage which could be evened out in a longer observation period

3.  **Best practices on how to optimise C2E to be explored:** C2E works, but the optimal conditions required to make it work best are still to be refined through more testing and research

4.  **Is the BoP market ready for such an edgy concept?** Concept and individual business case (savings vs. electricity costs) quite hard to understand by BoP populations and difficult to communicate in a comprehensible way (partly due to the concepts ground-breaking character) - to be explored how this could be solved and how uptake would be if customers fully understood the mechanism and the positive financial impact for them

5.  **Testing only completed where payments were < electricity costs:** Electricity costs in pilot covered 35-80% of kWh electricity costs - testing C2E with higher carbon pricing or lower kWh costs, where payments exceed electricity cost (i.e. free electric cooking), could have markedly different results.

6. **Only $ payments tested so far:** Monetary incentives have been tested in pilot only - other ways of incentivising usage to be explored for deeper understanding on what changes cooking behaviour

# 5.3 Way Forward: Project extension to fully test out Cook-To-Earn as a concept

Many good findings were found throughout the study, but as with any innovative approach the findings then lead to further questions and areas to test for optimisation and scale.  Based on findings, ATEC recommends the below areas for further investigation:

- **Scale Test education nudges** on concept, savings and impact on electricity bill with a larger sample and over a longer period of time
- **Utilise C2E funding to lean test rewards** rather than micropayments and see if this has a more significant nudge on behaviour
- **Utilise C2E funding to offset hardware costs** rather than electricity costs and see if that is a more significant nudge on behaviour.  This could be either through reducing upfront cost or offset against paygo payments.
- **Test utilisation of eCook app** for processes around creating better customer understanding/ higher uptake, particular notifications for an effective customer sign-up phase within the first few days *when likely the window for behavioural change on primary cooking device selectionis widest open*.