MECS ECO Challenge Fund

Final Report for Theme 1: Community Scale Pilot Studies

BURN Manufacturing Co.

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Executive summary

BURN has leveraged the funds from the MECS ECO challenge fund to continue developing a product for SSA, tailored to the cooking needs in each of BURN's target markets for electrical cooking appliances. The aim of the study is understanding cooking practices of potential markets for EPC in Uganda and Kenya. Pilot sales of 200 EPCs in Uganda allowed BURN to get a better understanding of local cooking practices; popular dishes, fuels used to cook specific foods, cooking challenges, cooking times, assess to reliable electricity, and expectations of cooking with electricity.

The typical Ugandan EPC customer is a woman in her late 20s to early 30s, living in a 4–5-person household in Kampala, working as a trade person/shop owner. 93% of the participants were charcoal users with an average usage frequency of 1-2 times per day, and spending between $2.8 to $3.5 per day on charcoal. The most cooked dishes amongst the participants were matoke, rice, and beans, respectively, which together account for close to 50% of all dishes cooked over the project period. Overall, the EPC usage was low with only 11% of all dishes cooked at the end of the project period. However, at the end of the project period, beans were by far the most popular dish cooked on the EPC with 46% of all beans recorded cooking events. The EPC has the potential not just for saving money on fuels, but also for saving time as the EPC can reduce the cooking times for most dishes by ½ to ¾. The effect of this can be observed in the time-of-day participants prefer to cook their beans. With charcoal, the participants would start preparing beans in the morning between 9-11 am, whereas with the EPC they were more likely to start cooking around midday (70%). With the shorter cooking time, 40 minutes compared to 2 hours, the beans would still be ready for lunch around 1-2 pm.

The average self-recorded electricity consumption per dish at endline was 0.4 kWh which is equivalent to a medium cooking time dish taking around 30 minutes to cook on the EPC (for example rice). The energy meter measured an average of 0.28 kWh per cooking event, and 0.61 kWh per day.

BURN found a reduction in the use of biomass fuels after introducing the EPC. Charcoal consumption decreased from 87.2% to 82%, and firewood from 6.1% to 0.4%. 89% of the participants reporting that they prefer to cook with electricity more than with other fuels. They appreciate that the EPC saves time, it is clean and convenient, and 91% have already recommended the EPC to others. Most participants do not experience serious challenges with power outages, however, 28% mentioned having power cuts on a weekly basis.

The project roll-out started at the peak of covid-19, which inflicted several challenges and limitations on the implementation of the project and throughout. The covid-19 restrictions in Uganda were exceptionally strict compared with other East African countries. Multiple lockdowns were imposed during the project period with restrictions on movement and business operations - at certain hours of the day or for days in a row. Consequently, customer acquisition slowed down, or stopped, during these lockdowns and many Ugandans left Kampala and returned to their villages. Additionally, the lockdowns limited the team's access to the customers for complete in-person training and follow-up visits which are essential in incentivizing and maximizing customer usage. One could expect the outcomes of this project to give a higher usage rate under different circumstances - though this is still to be trialed.

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1. Introduction

1.1. Covid-19 caveat

The project roll-out started at the peak of covid-19, which inflicted several challenges and limitations on the implementation of the project and throughout. The covid-19 restrictions in Uganda were exceptionally strict compared with other East African countries. Multiple lockdowns were imposed during the project period with restrictions on movement and business operations - at certain hours of the day or for days in a row. Consequently, customer acquisition slowed down, or stopped, during these lockdowns and many Ugandans left Kampala and returned to their villages. Additionally, the lockdowns limited the team's access to the customers for complete in-person training and follow-up visits which are essential in incentivizing and maximizing customer usage. One could expect the outcomes of this project to give a higher usage rate under different circumstances - though this is still to be trialed.

1.2. Aims and Objectives

BURN is confident that the electric pressure cooker (EPC), developed for the SSA market, is well-positioned for success. EPCs provide consumers with increased energy efficiency as compared to traditional cooking methods, as well as considerable time savings. Increased energy efficiency allows users to find savings in a matter of weeks from traditional fuel expenses.

Figure 1: The ecoa EPC

In this project, BURN's Strategy and Market Research team, together with local partners, conducted pilot sales in Uganda to collect data related to the unique cooking needs of the market. The findings will support the commercialization of a customized EPC designed specifically for the Sub-Saharan African market.

The overall aim of the project is to develop a good understanding of how the EPC fits with the Ugandan target customer who requires a more affordable and clean method of cooking that does not demand a lot of attention. Specifically, the main objective is to understand customers cooking habits, fuel usage, and behavioral changes when presented with the EPC.

This study specifically targets women who spend the most time cooking and are therefore more vulnerable to cooking emissions and stand the most to gain from both a health perspective as well as time savings. The study focused on the grid-connected market, which is extensive in urban and peri-urban areas in Uganda.

Through the studies outlined herein, BURN intends to address the current lack of product awareness. Data obtained through these studies will enable BURN to directly cater to the needs of the target market by developing a product that will suit the cooking culture of the region.

Principal research questions:

1. Are electric cooking devices compatible with local cooking practices?
2. How much energy is used for cooking in practice?

Types of data collected:

1. Breakdowns of meals cooked, and water heating
2. Individual dishes (or foods) cooked as part of a meal
3. Fuels used to cook
4. Energy consumption
5. Cooking times (time of day and duration)

1.3. Background

Uganda is a landlocked country located north of the Victoria Lake in East-Central Africa with a population of approximately 43 million. In the urban areas, 57% of households use charcoal for cooking. Urban access to electricity is 71% with a cost of $0.19 per kWh. This sets urban and peri-urban Uganda as the perfect market for acquiring charcoal users that have the most to gain from switching to electric cooking in terms of fuel expenses and health benefits. For this project, BURN is targeting the districts of Kampala, Wakiso and, Mukono where grid connectivity is more reliable. When it comes to cooking habits, the most common staple foods across Uganda are matoke, posho, and cassava. Other popular dishes are beans, cowpeas, vegetables, and groundnuts, Beef, chicken, and other meats are considered more of a delicacy and generally prepared on specific days of the week or for special occasions. The cultural and local perception that most foods taste better when cooked on charcoal contributes to the high charcoal usage seen across the country.

Uganda has mainly two seasons, wet and dry. The dry seasons are harvest periods whereas the wet seasons are planting seasons. Some foods are only available during the harvest season while others are available all year through because they can be preserved as both fresh and dry foods. Some of the foods available seasonally and only during the harvest periods are Cassava, Sweet Potatoes, Groundnuts, Irish Potatoes, and Green Peas. On the contrary some foods are only available during the wet seasons since they take a short time to mature and require lots of water to facilitate their growth. These include vegetables, and cabbages. These foods are only cooked seasonally, and the frequency of preparation is highly dependent on availability.

2. Methodology

A total of 200 customers located in Kampala, Wakiso (including Entebbe), and Greater Mukono districts of Uganda were selected to participate in the BURN/MECS EPC study. Low-income charcoal users were the primary target participants who were offered to purchase the EPC on a loan to be repaid in monthly installments of $17 over 6 months. At the time of purchase, participants were only required to give a deposit (first installment) of $17 to take the EPC home.

Figure 2: BURN staff promoting the ecoa EPC

The EPCs were sold and distributed between December 2020 and January 2022, with the last EPC being delivered on 22nd January 2022. Project data collection was effectively carried out throughout this period, and the exit survey was completed by 13th of March 2022.

This report analyzes data collected from the baseline survey, cooking diaries, energy meters, and endline survey, as described in the following sections:

2.1. Baseline Survey

A baseline survey was conducted with all 200 customers during the first week after purchase. The purpose of the survey was to establish the customer demographics, fuel usage, and expectations of cooking with the EPC. Valid surveys were collected from 180 customers, with 20 surveys left incomplete due to errors made by the enumerators.

2.2. Cooking Diaries

The purpose of the cooking diaries is to uncover customers' cooking habits; meals and dishes cooked, cooking times, and fuels used to cook. The 200 households participating in the study were divided into two groups: 60 participants were using a mixed cooking diaries intensive/light approach, and 140 participants were using a cooking diary light approach. Cooking diaries were collected through a series of calls with the customer throughout the project period as described below:

- **Intensive/light:** The 60 intensive/light cooking diary participants received daily calls for 3 weeks pre-EPC (Phase 1 - Baseline), daily calls for 3 weeks post-EPC (Phase 2 - Transition), bi-weekly calls for 2-4 months (Phase 3 - Light), and daily calls for 2 weeks at the project end (Phase 4 - Endline).
- **Light**: The 140 light cooking diary participants received calls every 2 weeks for 3-6 months (depending on date of purchase) after purchasing the EPC (Phase 3 – Light).

111 customers completed the light diaries, while 60 customers completed the intensive/light diaries.

2.3. Energy Meter

100 customers in the study were given an energy meter to track and log their energy consumption for the EPC. The energy meter also displays the energy usage to the cook which helps to tackle the existing perception that cooking with electricity is prohibitively expensive.

2.4. Endline Survey

The endline survey was conducted at the end of the project period, in March 2022. Most questions were open-ended focusing on the customers cooking experiences, behavior changes, electricity supply, preference for cooking fuels and general attitude towards cooking with electricity. The survey was fairly long and took around 45 minutes to complete. The survey length combined with customer fatigue from the cooking diary calls, especially amongst the intensive dairy customers, made it difficult to conduct the survey with all customers. 90 surveys were successfully conducted, with an additional 10 surveys that were incomplete and therefore not included in the analysis.

3. Main Research Findings

3.1. Baseline Survey

The typical Ugandan EPC customer is a woman (63.9%) in her late 20s (18.3%), living in a 4–5-person household (35%) in Kampala (52.8%), working as a trade person/shop owner (47.8%). 93% of the customers were charcoal users with an average usage frequency of 1-2 times er per day, and spending between $2.8 to $3.5 (36%) or more (33%) on charcoal per day. The study had a relatively high number of male participants (36%) where most were part of a couple or family consisting of 2 or more people (88%). See Charts 1 to 8 and Table 1:

Chart 1: Participant gender

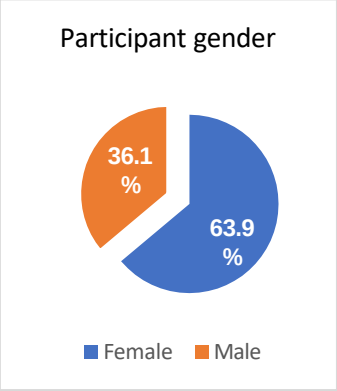


Chart 2: Participant age group by gender

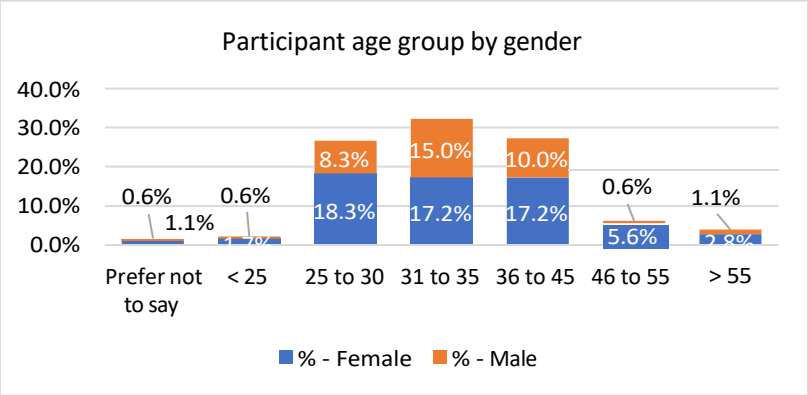


Chart 3: Chart 3: Participant household size

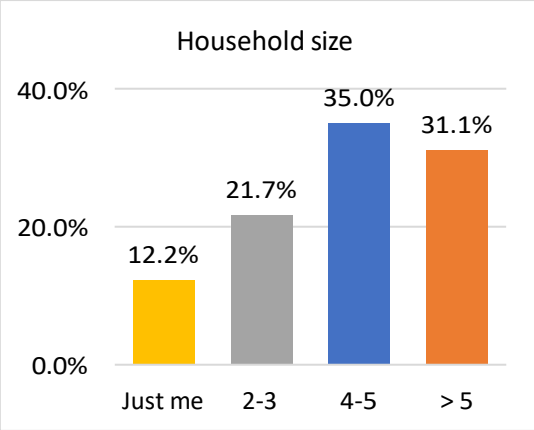


Chart 4: Household size by gender

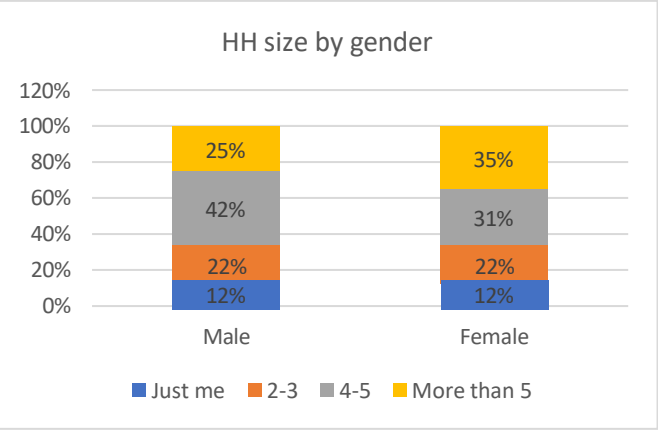


Chart 5: Participant location

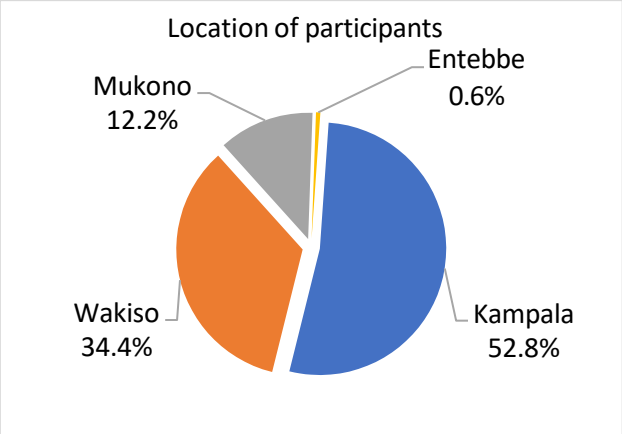


Chart 6: Participant occupation

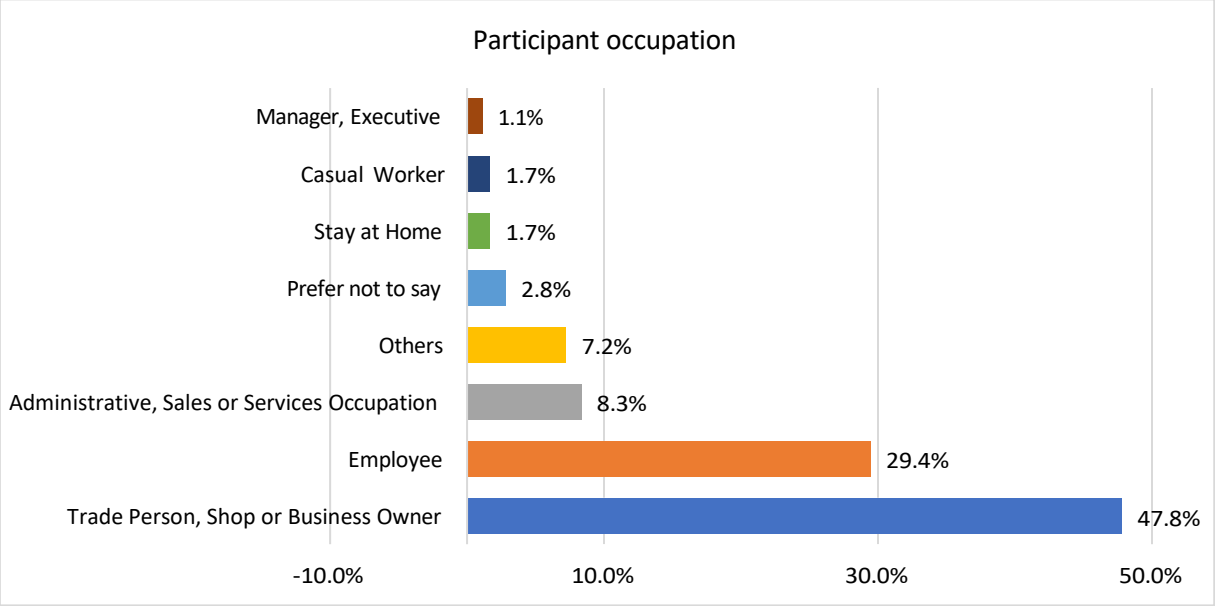


Chart 7: Fuels used to cook

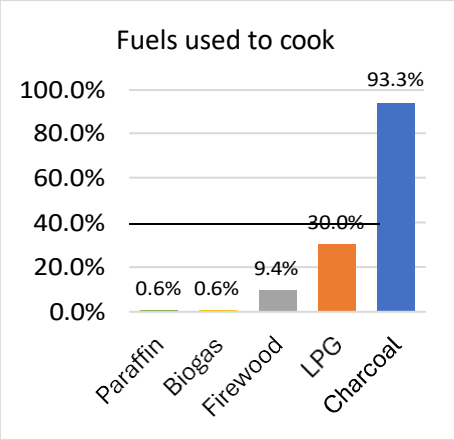


Chart 8: Weekly charcoal budget

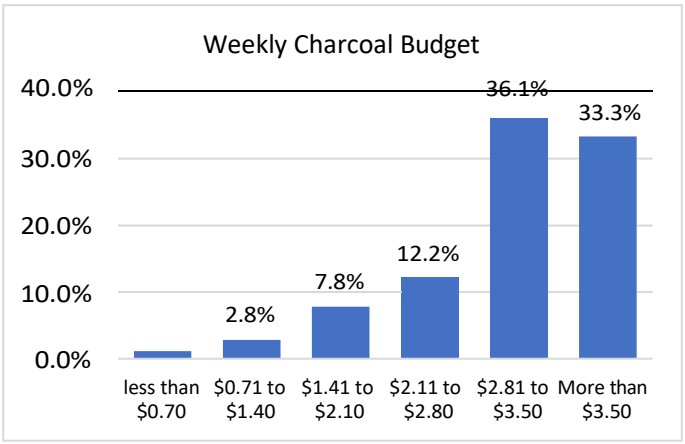


Table 1: Fuel usage frequency

Fuel Use	Paraffin	Biogas	Firewood	LPG	Charcoal
Do not use	99.4%	99.4%	90.6%	70.0%	6.7%
Less	0.6%	0.6%	1.1%	5.6%	2.8%
1-2 times/week	0.0%	0.0%	1.1%	4.4%	1.7%
3-5 times/week	0.0%	0.0%	2.8%	12.2%	41.1%
1 time/day	0.0%	0.0%	2.8%	5.6%	8.9%
2-3 times/day	0.0%	0.0%	1.7%	2.2%	38.9%

Before purchasing the EPC, 53% had never seen or heard of an EPC before while the rest had some familiarity with it. The main benefits expected from cooking with the EPC was that it would save time (81%), make cooking more convenient (54%), save money 42%), and improve the family's safety (32%).

3.2. Cooking Diaries

3.2.1. Overview of Data:

The participants in the Uganda study were asked to record meals cooked and dishes included in each meal (including water heating). In phase 1, the 60 customers who participated in the intensive diaries were asked to not make any changes to their cooking habits and record the meals and dishes cooked for 3 weeks before purchasing the EPC. In phase 2, they purchased the electric pressure cooker, were trained on how to use it (but not explicitly requested to use it) and continued to record daily meals and dishes cooked on all fuels for 3 weeks. In phase 3, all customers (intensive and light) received bi-weekly calls recording meals and dishes cooked for 3-6 months after purchasing the EPC. In phase 4, daily calls were again made to the 60 intensive diary customers at the end of the project period. The diaries were recorded directly in KoboToolbox by the enumerators making the calls. 3,600 valid entries were successfully collected for 171 customers (60 intensive and 111 light participants) (Table 2). Table 3 presents the purpose of cooking split into breakfast, lunch, and supper, showing the number of meals and dishes. A total of 5,531 meals and 7,491 dishes were recorded (two dishes did not state the meal type in Phase 4).

Table 2: Number of participants and entries for Phase 1, 2, 3, and 4

Phase	Participants	Entries	Percent
Phase 1 - Baseline	60	900	25%
Phase 2 - Transition	60	900	25%
Phase 3 (Intensive Customers)	60	385	11%
Phase 3 (Light Customers)	111	854	24%
Phase 4 - Endline	60	561	16%
Total	**171**	**3,600**	**100%**

Table 3: Number of meals and dishes cooked for breakfast, lunch, and supper

	Breakfast		Lunch		Supper		Total	
Count	**Meals**	**Dishes**	**Meals**	**Dishes**	**Meals**	**Dishes**	**Meals**	**Dishes**
Phase 1 - Baseline	225	235	717	913	558	756	1500	1,904
Phase 2 - Transition	280	311	789	1,039	562	830	1631	2,180
Phase 3 (Intensive)	99	106	149	171	182	217	430	494
Phase 3 (Light)	189	207	439	583	417	613	1045	1403
Phase 4 - Endline	120	140	446	790	359	578	925	1,508
Total	**913**	**999**	**2,540**	**3,496**	**2,078**	**2,994**	**5,531**	**7,489**

3.2.2. Meals and Dishes Cooked

Table 4 shows an overview of dishes (foods) cooked for breakfast, lunch, and supper, across phase 1, 2, 3, and 4. The most popular dishes are matoke, rice, and beans, respectively, which together accounts for 45.6% of all dishes cooked throughout the project period. The frequency of dishes cooked is relatively consistent between phases which indicates that the customers did not make significant changes in their cooking habits after purchasing the EPC. However, in phase 4 the customers were more likely to cook rice (18%) than matoke (14%).

Table 4*: Dishes cooked in Phase 1, 2, 3 and 4*

	Phase 1 (Intsv.)		Phase 2 (Intsv.)		Phase 3 (Intsv.)		Phase 3 (Light)		Phase 4 (Intsv.)		Total	
Dish	**count**	**%**	**count**	**%**	**count**	**%**	**count**	**%**	**count**	**%**	**Count**	**%**
Matoke	355	19%	389	18%	123	24.9%	244	17%	205	14%	1316	18%
Rice	306	16%	332	15%	79	16%	222	16%	269	18%	1208	16%
Beans	219	12%	279	13%	40	8%	187	13%	170	11%	895	12%
Sweet potatoes/cassava/taro root/Irish	149	8%	158	7%	54	11%	106	8%	140	9%	607	8%
Leafy veg/Salads	146	8%	149	7%	20	4%	87	6%	133	9%	535	7%
Ugali	129	7%	159	7%	34	7%	114	8%	95	6%	531	7%
Beef/Goat/Meat/Liver	95	5%	176	8%	49	10%	90	6%	83	5%	493	7%
Groundnuts	117	6%	124	6%	13	3%	84	6%	72	5%	410	5%
Soup (goat, beef, fish)	65	3%	80	4%	11	2%	30	2%	64	4%	250	3%
Fried fish/Fish stew/Dry fish/Silver fish/Pasted fish	56	3%	73	3%	7	1%	30	2%	60	4%	226	3%
Katogo	35	2%	31	1%	4	1%	27	2%	49	3%	146	2%
Posho	64	3%	37	2%	5	1%	17	1%	16	1%	139	2%
Fish stew (boiled)	33	2%	39	2%	21	4%	25	2%	17	1%	135	2%
Peas	28	1%	37	2%	1	0%	19	1%	39	3%	124	2%
Duck/chicken stew	21	1%	37	2%	12	2%	18	1%	20	1%	108	1%
Porridge	13	1%	19	1%	7	1%	47	3%	6	0%	92	1%
Pilao	21	1%	11	1%		0%	10	1%	18	1%	60	1%
Macroons	14	1%	9	0%	3	1%		0%	14	1%	40	1%
Groundnuts Mix	11	1%	14	1%		0%	6	0%	8	1%	39	1%
Eggs	7	0%	7	0%	3	1%	7	0%	5	0%	29	0%
Egg Plant	5	0%	2	0%		0%	6	0%	4	0%	17	0%
Pasta		0%	1	0%		0%	6	0%	10	1%	17	0%
Spaghetti	2	0%	1	0%		0%	13	1%	1	0%	17	0%
Chapati	5	0%	3	0%	1	0%	3	0%	4	0%	16	0%
Atapa/Bread	2	0%	5	0%	4	1%	3	0%	1	0%	15	0%
Plantain/Bananas (hard)	3	0%	2	0%	3	1%	1	0%	2	0%	11	0%
Millet	1	0%	4	0%		0%	1	0%	1	0%	7	0%
Cassava leaves	1	0%	1	0%		0%		0%	1	0%	3	0%
Mlenda		0%	1	0%		0%		0%	1	0%	2	0%
Okra	1	0%		0%		0%		0%	1	0%	2	0%
Makande		0%		0%		0%		0%	1	0%	1	0%
Grand Total	**1904**	**100%**	**2180**	**100%**	**494**	**100%**	**1403**	**100%**	**1510**	**100%**	**7491**	**100%**

The most popular dishes for each meal (breakfast, lunch, and supper) are displayed in Table 5. Beans are most frequently cooked for breakfast, while most participants tend to prepare rice or matoke for lunch and supper. Other dishes frequently cooked for breakfast are beef/goat/meat/liver and matoke. For lunch ugali and beans are common, and for supper potatoes/roots and groundnuts are popular.

Table 5: *Top 10 dishes cooked for breakfast, lunch, and supper*

		Phase 1 (Intsv.)		Phase 2 (Intsv.)		Phase 3 (Intsv.)		Phase 3 (Light)		Phase 4 (Intsv.)		Total No of Dishes	
Meal	**Which dish was prepared?**	**No of Dishes**	**%**	**No of Dishes**	**%**	**No of Dishes**	**%**	**No of Dishes**	**%**	**Count**	**%**	**Count**	**%**
Breakfast	Beans	89	40%	123	41%	19	18%	70	35%	57	45%	358	37%
	Beef/Goat/Meat/Liver	26	12%	52	17%	36	34%	27	14%	10	8%	151	16%
	Matoke	38	17%	48	16%	6	6%	28	14%	21	16%	141	15%
	Porridge	13	6%	15	5%	6	6%	31	16%	5	4%	70	7%
	Rice	11	5%	8	3%	15	14%	13	7%	10	8%	57	6%
	Duck/chicken stew	9	4%	15	5%	10	9%	12	6%	5	4%	51	5%
	Sweet potatoes/cassava/taro root/Irish	12	5%	14	5%	5	5%	5	3%	7	5%	43	4%
	Fish stew (boiled)	8	4%	9	3%	9	8%	6	3%	3	2%	35	4%
	Peas	8	4%	11	4%	0	0%	4	2%	6	5%	29	3%
	Katogo	7	3%	6	2%	0	0%	4	2%	4	3%	21	2%
	Total	**221**	**100%**	**301**	**100%**	**106**	**100%**	**200**	**100%**	**128**	**100%**	**956**	**100%**
Lunch	Matoke	169	21%	175	19%	25	16%	109	21%	147	22%	625	20%
	Ugali	157	19%	139	15%	55	35%	90	17%	78	12%	519	17%
	Beans	101	12%	143	16%	17	11%	84	16%	82	12%	427	14%
	Sweet potatoes/cassava/taro root/Irish	75	9%	120	13%	15	10%	63	12%	83	13%	356	12%
	Leafy veg/Salads	71	9%	91	10%	21	13%	53	10%	69	10%	305	10%
	Beef/Goat/Meat/Liver	89	11%	86	9%	7	4%	37	7%	80	12%	299	10%
	Groundnuts	44	5%	49	5%	9	6%	32	6%	43	6%	177	6%
	Soup (goat, beef, fish)	47	6%	41	5%	7	4%	38	7%	35	5%	168	5%
	Posho	22	3%	36	4%	1	1%	14	3%	29	4%	102	3%
	Fried fish/Fish stew/Dry fish/Silver fish/Pasted fish	47	6%	26	3%	0	0%	9	2%	16	2%	98	3%
	Total	**822**	**100%**	**906**	**100%**	**157**	**100%**	**529**	**100%**	**662**	**100%**	**3076**	**100%**
Supper	Matoke	160	24%	202	27%	62	32%	126	24%	105	21%	655	25%
	Rice	126	19%	149	20%	39	20%	100	19%	112	22%	526	20%
	Sweet potatoes/cassava/taro root/Irish	66	10%	53	7%	28	15%	48	9%	64	13%	259	10%
	Groundnuts	66	10%	81	11%	6	3%	46	9%	32	6%	231	9%
	Leafy veg/Salads	54	8%	62	8%	13	7%	48	9%	51	10%	228	9%
	Beans	55	8%	36	5%	6	3%	54	10%	30	6%	181	7%
	Beef/Goat/Meat/Liver	25	4%	75	10%	4	2%	31	6%	30	6%	165	6%
	Fried fish/Fish stew/Dry fish/Silver fish/Pasted fish	39	6%	42	6%	7	4%	20	4%	40	8%	148	6%
	Soup (goat, beef, fish)	41	6%	44	6%	10	5%	16	3%	33	6%	144	5%
	Ugali	26	4%	13	2%	17	9%	29	6%	12	2%	97	4%
	Total	**658**	**100%**	**757**	**100%**	**192**	**100%**	**518**	**100%**	**509**	**100%**	**2634**	**100%**

Table 6 shows the occurrences of dishes in meals including one or multiple dishes. Approximately 1/2 of the dishes prepared are eaten on their own (a complete meal), while 1/2 are part of a larger meal.

Table 6: Occurrence of dishes in meals by number of dishes in the meal (all phases)

Dish	1	2	3	4	5	6	Total
Matoke	566	630	105	12	2	1	1,316
Rice	632	457	105	11	2	1	1,208
Beans	563	258	66	7	1		895
Sweet potatoes/cassava/taro root/Irish	341	203	52	8	2	1	607
Leafy veg/Salads	230	245	50	9	1		535
Ugali	309	175	32	12	2	1	531
Beef/Goat/Meat/Liver	243	213	29	5	2	1	493
Groundnuts	135	238	35	2			410
Soup (goat, beef, fish)	99	117	30	4			250
Fried fish/Fish stew/Dry fish/Silver fish/Pasted fish	79	131	15	1			226
Katogo	91	36	17	2			146
Posho	62	65	12				139
Fish stew (boiled)	93	30	10	1		1	135
Peas	67	36	19	1	1		124
Duck/chicken stew	61	39	8				108
Tea	66	29	2				97
Porridge	82	7	3				92
Pilao	39	13	7	1			60
Macroons	28	10	2				40
Groundnuts Mix	12	20	6	1			39
Eggs	23	6					29
Egg Plant	9	7	1				17
Pasta	5	7	2	2	1		17
Spaghetti	9	4	3		1		17
Chapati	12	4					16
Atapa/Bread	10	5					15
Plantain/Bananas (hard)	7	3		1			11
Millet	2	5					7
Cassava leaves	3						3
Mlenda	1	1					2
Okra		1	1				2
Makande		1					1
Grand Total	**3,879**	**2,996**	**612**	**80**	**15**	**6**	**7,588**

3.2.3. Challenges of cooking some foods with the EPC

3.2.3.1. Groundnuts

Groundnut stew requires constantly simmering at a low regulated temperature until when ready. This usually requires patience as it takes up to 3 hours for it to be fully ready under low heat. When using an

EPC, the temperature is constantly high and challenging to regulate, this consequently made the stew to get burnt and impossible to make it get ready.

3.2.3.2. Matoke/cassava

Traditionally, matoke and cassava are wrapped in banana leaves, placed in a saucepan, steamed and mashed when soft enough (for matooke only). This has a cultural connotation, and many households feel the matooke and cassava tastes better when prepared this way using either charcoal or firewood as a source of fuel. One of the challenges with using an EPC is that the capacity is small and therefore challenging to prepare a sufficient matoke/cassava for most of these households. Many also felt it was a challenge to regulate and easily monitor the matoke/cassava since these are prepared under controlled heat during the steaming process (when wrapped in banana leaves).

3.2.4. Reheating

When recording meals and dishes cooked the participants were asked to report whether the dish was fresh, partially cooked, or reheated. The results are presented in Table 7 which shows that most of the dishes were prepared fresh. Participants rarely/never partially cooked their dishes and reheating mainly occurred for supper. For the intensive customers in Phase 3, close no dishes were reheated. This could be an indicator of higher EPC usage leading to lower frequency of reheating as foods are cooked fresh.

Table 7: Number of dishes that were prepared fresh, partially cooked, or reheated

		Fresh		Partially cooked		Reheated		Total	
Diary Phase 2	**Meal Type**	**Count**	**%**	**Count**	**%**	**Count**	**%**		
Phase 1 (Intsv.)	Breakfast	226	96.2%	0	0.0%	9	3.8%	235	100%
	Lunch	905	99.1%	0	0.0%	8	0.9%	913	100%
	Supper	674	89.2%	1	0.1%	81	10.7%	756	100%
	Total	**1805**	**94.8%**	**1**	**0.1%**	**98**	**5.1%**	**1904**	**100%**
Phase 2 (Intsv.)	Breakfast	303	97.4%	0	0.0%	8	2.6%	311	100%
	Lunch	1024	98.6%	0	0.0%	15	1.4%	1039	100%
	Supper	755	91.0%	0	0.0%	75	9.0%	830	100%
	Total	**2082**	**95.5%**	**0**	**0.0%**	**98**	**4.5%**	**2180**	**100%**
Phase 3 (Intsv.)	Breakfast	105	99.1%	0	0.0%	1	0.9%	106	100%
	Lunch	171	100.0%	0	0.0%	0	0.0%	171	100%
	Supper	217	100.0%	0	0.0%	0	0.0%	217	100%
	Total	**493**	**99.8%**	**0**	**0.0%**	**1**	**0.2%**	**494**	**100%**
Phase 3 (Light)	Breakfast	204	98.6%	0	0.0%	3	1.4%	207	100%
	Lunch	582	99.8%	0	0.0%	1	0.2%	583	100%
	Supper	576	94.1%	0	0.0%	36	5.9%	612	100%
	Total	**1362**	**97.1%**	**0**	**0.0%**	**40**	**2.9%**	**1402**	**100%**
Phase 4 (Intsv.)	Breakfast	137	97.9%	0	0.0%	3	2.1%	140	100%
	Lunch	788	99.7%	0	0.0%	2	0.3%	790	100%
	Supper	521	90.1%	0	0.0%	57	9.9%	578	100%
	Total	**1446**	**95.9%**	**0**	**0.0%**	**62**	**4.1%**	**1508**	**100%**
Grand Total		**7188**	**96.0%**	**1**	**0.0%**	**299**	**4.0%**	**7488**	**100%**

Table 8 shows an overview of the dishes most frequently reheated. For phase 1, 2 and 3, beans are the most frequently reheated dish, followed by soup and matoke (except for phase 3 intensive customers). In phase 4 (endline), there is a drop in the frequency of reheating beans and matoke, and an increase in reheating soup and katogo. Uganda has mainly two seasons, wet and dry. The dry seasons are harvest periods whereas the wet seasons are planting seasons. Some foods are only available during the harvest season while others are available all year through because they can be preserved as both fresh and dry foods. Some of the foods available seasonally and only during the harvest periods are Cassava, Sweet Potatoes, Groundnuts, Irish Potatoes, and Green Peas. On the contrary some foods are only available during the wet seasons since they take a short time to mature and require lots of water to facilitate their growth. These include vegetables, and cabbages. These foods are only cooked seasonally, and the frequency of preparation is highly dependent on availability. The seasonal variations described above could also have influenced the outcomes observed in frequency of reheating.

Table 8: Distribution of reheated foods across the four phases

	Phase 1 (Intsv.)		Phase 2 (Intsv.)		Phase 3 (Intsv.)		Phase 3 (Light)		Phase 4 (Intsv.)		Total	
Dish	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**
Beans	34	34.7%	24	24.5%	0	0.0%	14	35.0%	18	29.0%	90	30.1%
Soup (goat, beef, fish)	18	18.4%	18	18.4%	0	0.0%	6	15.0%	21	33.9%	63	21.1%
Matoke	10	10.2%	15	15.3%	0	0.0%	4	10.0%	2	3.2%	31	10.4%
Katogo	6	6.1%	8	8.2%	0	0.0%	3	7.5%	10	16.1%	27	9.0%
Peas	8	8.2%	5	5.1%	0	0.0%	5	12.5%	5	8.1%	23	7.7%
Pilao	7	7.1%	3	3.1%	0	0.0%	5	12.5%	2	3.2%	17	5.7%
Beef/Goat/Meat/Liver	1	1.0%	9	9.2%	0	0.0%	0	0.0%	1	1.6%	11	3.7%
Groundnuts Mix	3	3.1%	3	3.1%	0	0.0%	2	5.0%	1	1.6%	9	3.0%
Fried fish/Fish stew/Dry fish/Silver fish/Pasted fish	1	1.0%	7	7.1%	0	0.0%	0	0.0%	0	0.0%	8	2.7%
Groundnuts	3	3.1%	3	3.1%	0	0.0%	1	2.5%	1	1.6%	8	2.7%
Rice	3	3.1%	1	1.0%	0	0.0%	0	0.0%	0	0.0%	4	1.3%
Leafy veg/Salads	1	1.0%	1	1.0%	0	0.0%	0	0.0%	1	1.6%	3	1.0%
Ugali	2	2.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	0.7%
Sweet potatoes/cassava/taro root/Irish	1	1.0%	1	1.0%	0	0.0%	0	0.0%	0	0.0%	2	0.7%
Duck/chicken stew	0	0.0%	0	0.0%	1	100.0%	0	0.0%	0	0.0%	1	0.3%
Total	**98**	**100%**	**98**	**100%**	**1**	**100%**	**40**	**100%**	**62**	**100%**	**299**	**100%**

3.2.5. Fuels and Cooking Devices

Chart 8 display the share of fuels used across all dishes for each phase. The participants in the Uganda study were primarily charcoal users (87.4% at baseline). Over the project period, there was a reduction in charcoal and firewood usage, a small increase in gas consumption, and a larger increase in EPC (electricity) usage. In Phase 2, just after purchase, the intensive customers had a low uptake of the EPC at ~3%. In Phase 3 this increased to ~6% for the intensive customers, however, the light customers remained at ~2.5% throughout the period. The intensive customers also increased their gas consumption, first in Phase 2 (7.5%), then in Phase 3 (11.9%). Firewood usage remained the same across Phase 1-3. Interestingly, in Phase 4 the intensive customers replaced almost all their firewood usage and halved their Gas usage from phase 3 to ~6.3%. During the same period, EPC usage more than doubled to 11.3%. From baseline to Phase

3, we observe that the customers are using the EPC more and more. First, the charcoal usage decreases slightly then even more as it's replaced by both the EPC and Gas. At the end, the charcoal usage increases slightly again, while the gas usage decreases. It could be that the customers realized the high cost of using LPG and returned to charcoal.

As the customers become more comfortable with the EPC over time, they adapt their cooking to where the different fuels are best optimized. The difference in usage between the light and intensive customers is likely do to the level of engagement with the field agents who would support and advice the customers on operating the EPC and encouraging them to try new dishes.

Chart 8: Fuels used to cook

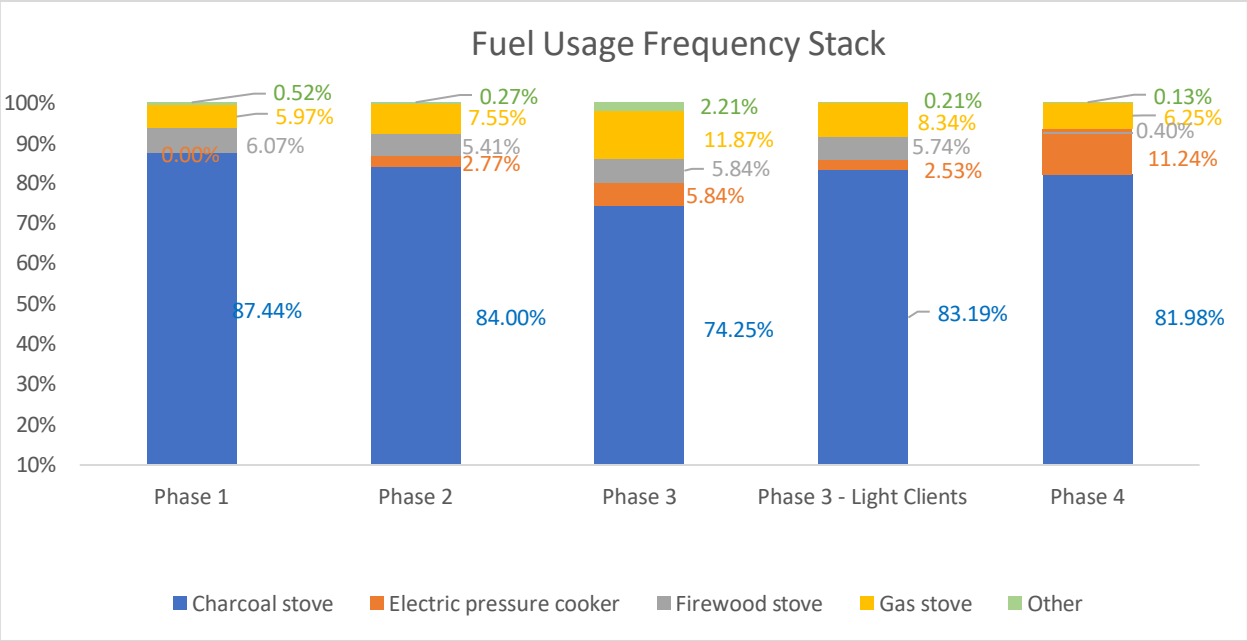


Table 9 shows the fuel usage across both meals and phases. "Other" includes electric hotplate, kerosene stove, and rice cooker. At endline, the EPC was used to prepare 17% of dishes for breakfast, 12% for lunch, and 9% for supper – overall, 11.2% of all dishes.

Table 9: Fuels used to cook dishes for breakfast, lunch, and supper for each phase

	Fuel	Charcoal stove		EPC		Firewood stove		Gas stove		Other		Grand Total	
Meal Type	Diary Phase	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Breakfast	Phase 1 (intsv.)	199	85%	0	0%	31	13%	3	1%	1	0%	234	100%
	Phase 2 (intsv.)	268	87%	4	1%	31	10%	2	1%	4	1%	309	100%
	Phase 3 (intsv.)	98	92%	1	1%	5	5%	0	0%	2	2%	106	100%
	Phase 3 (Light)	187	90%	0	0%	7	3%	13	6%	0	0%	207	100%
	Phase 4 (intsv.)	110	80%	23	17%	3	2%	1	1%	0	0%	137	100%

	Breakfast Total	**862**	87%	**28**	3%	**77**	8%	**19**	2%	**7**	1 %	993	100 %
Lunch	Phase 1 (intsv.)	837	92%	0	0%	43	5%	25	3%	7	1 %	912	100 %
	Phase 2 (intsv.)	881	85%	47	5%	61	6%	48	5%	1	0 %	1038	100 %
	Phase 3 (intsv.)	135	79%	17	10 %	14	8%	0	0%	5	3 %	171	100 %
	Phase 3 (Light)	496	85%	22	4%	46	8%	16	3%	3	1 %	583	100 %
	Phase 4 (intsv.)	660	84%	92	12 %	3	0%	32	4%	1	0 %	788	100 %
	Lunch Total	**3009**	86%	**178**	5%	**167**	5%	**121**	3%	**17**	0 %	3492	100 %
Supper	Phase 1 (intsv.)	626	83%	0	0%	42	6%	86	11 %	2	0 %	756	100 %
	Phase 2 (intsv.)	680	82%	10	1%	26	3%	112	14 %	1	0 %	829	100 %
	Phase 3 (intsv.)	133	61%	11	5%	10	5%	59	27 %	4	2 %	217	100 %
	Phase 3 (Light)	494	81%	15	2%	29	5%	75	12 %	0	0 %	613	100 %
	Phase 4 (intsv.)	461	80%	54	9%	0	0%	61	11 %	1	0 %	577	100 %
	Supper Total	**2394**	80%	**90**	3%	**107**	4%	**393**	13 %	**8**	0 %	2992	100 %
Grand Total		**6265**	84%	**296**	4%	**351**	5%	**533**	7%	**32**	0 %	7477	100 %

Table 10 separates the top 10 dishes by fuel used to cook and shows that the EPC was primarily used to cook beans. At the end of the project period (Phase 4), 46% of cooking events for beans were done using the EPC. Overall, 43% of all cooking events on the EPC was done for beans (Table 12). Some participants also used the EPC for beef/goat/meat/liver, potatoes/roots, and rice.

Table 10: Fuels used to cook the top 10 dishes for each phase

		Charcoal stove		**Electric pressure cooker**		**Firewood stove**		**Gas stove**		**Total**	
Which dish was prepared?	**Diary Phase 2**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**		
Beans	Phase 1 (Intsv.)	191	88%		0%	21	9.7%	5	2.3%	217	100.0%
	Phase 2 (Intsv.)	217	78%	33	12%	22	7.9%	7	2.5%	279	100.0%
	Phase 3 (Intsv.)	25	64%	5	13%	5	12.8%	4	10.3%	39	100.0%
	Phase 3 (Light)	149	80%	13	7%	20	10.7%	5	2.7%	187	100.0%
	Phase 4 (Intsv.)	87	51%	77	46%	2	1.2%	3	1.8%	169	100.0%
Total		**669**	**75%**	**128**	**14%**	**70**	**7.9%**	**24**	**2.7%**	**891**	**100.0%**
Matoke	Phase 1 (Intsv.)	314	89%		0%	32	9.1%	6	1.7%	352	100.0%
	Phase 2 (Intsv.)	334	86%	3	1%	33	8.5%	19	4.9%	389	100.0%

	Phase 3 (Intsv.)	110	92%		0%	5	4.2%	5	4.2%	120	100.0%
	Phase 3 (Light)	223	92%	1	0%	13	5.4%	5	2.1%	242	100.0%
	Phase 4 (Intsv.)	195	96%	5	2%	2	1.0%	1	0.5%	203	100.0%
Total		**1176**	**90%**	**9**	**1%**	**85**	**6.5%**	**36**	**2.8%**	**1306**	**100.0%**
Rice	Phase 1 (Intsv.)	267	88%		0%	7	2.3%	29	9.6%	303	100.0%
	Phase 2 (Intsv.)	274	83%	4	1%	5	1.5%	48	14.5%	331	100.0%
	Phase 3 (Intsv.)	53	70%	6	8%	1	1.3%	16	21.1%	76	100.0%
	Phase 3 (Light)	182	82%	9	4%	10	4.5%	21	9.5%	222	100.0%
	Phase 4 (Intsv.)	216	80%	28	10%		0.0%	25	9.3%	269	100.0%
Total		**992**	**83%**	**47**	**4%**	**23**	**1.9%**	**139**	**11.6%**	**1201**	**100.0%**
Soup (goat, beef, fish)	Phase 1 (Intsv.)	56	86%		0%	1	1.5%	8	12.3%	65	100.0%
	Phase 2 (Intsv.)	63	79%	1	1%	3	3.8%	13	16.3%	80	100.0%
	Phase 3 (Intsv.)		0%	2	18%	1	9.1%	8	72.7%	11	100.0%
	Phase 3 (Light)	23	77%		0%	3	10.0%	4	13.3%	30	100.0%
	Phase 4 (Intsv.)	55	86%	3	5%		0.0%	6	9.4%	64	100.0%
Total		**197**	**79%**	**6**	**2%**	**8**	**3.2%**	**39**	**15.6%**	**250**	**100.0%**
Ugali	Phase 1 (Intsv.)	115	90%		0%	7	5.5%	6	4.7%	128	100.0%
	Phase 2 (Intsv.)	150	94%	1	1%	7	4.4%	1	0.6%	159	100.0%
	Phase 3 (Intsv.)	29	88%	1	3%	3	9.1%		0.0%	33	100.0%
	Phase 3 (Light)	105	93%		0%	8	7.1%		0.0%	113	100.0%
	Phase 4 (Intsv.)	88	94%	1	1%		0.0%	5	5.3%	94	100.0%
Total		**487**	**92%**	**3**	**1%**	**25**	**4.7%**	**12**	**2.3%**	**527**	**100.0%**
Groundnuts	Phase 1 (Intsv.)	99	85%		0%	16	13.7%	2	1.7%	117	100.0%
	Phase 2 (Intsv.)	109	88%	1	1%	9	7.3%	5	4.0%	124	100.0%
	Phase 3 (Intsv.)	8	62%	1	8%	3	23.1%	1	7.7%	13	100.0%
	Phase 3 (Light)	78	93%		0%	5	6.0%	1	1.2%	84	100.0%
	Phase 4 (Intsv.)	71	99%	1	1%		0.0%		0.0%	72	100.0%
Total		**365**	**89%**	**3**	**1%**	**33**	**8.0%**	**9**	**2.2%**	**410**	**100.0%**
Fried fish/Fish stew/Dry fish/Silver fish/Pasted fish	Phase 1 (Intsv.)	52	93%		0%	3	5.4%	1	1.8%	56	100.0%
	Phase 2 (Intsv.)	56	77%		0%	1	1.4%	16	21.9%	73	100.0%

	Phase 3 (Intsv.)	5	71%		0%		0.0%	2	28.6%	7	100.0%
	Phase 3 (Light)	27	90%		0%		0.0%	3	10.0%	30	100.0%
	Phase 4 (Intsv.)	53	88%	4	7%		0.0%	3	5.0%	60	100.0%
Total		**193**	**85%**	**4**	**2%**	**4**	**1.8%**	**25**	**11.1%**	**226**	**100.0%**
Beef/Goat/Meat/Liver	Phase 1 (Intsv.)	90	95%		0%	4	4.2%	1	1.1%	95	100.0%
	Phase 2 (Intsv.)	159	92%	8	5%	2	1.2%	4	2.3%	173	100.0%
	Phase 3 (Intsv.)	44	94%	3	6%		0.0%		0.0%	47	100.0%
	Phase 3 (Light)	76	84%	6	7%	5	5.6%	3	3.3%	90	100.0%
	Phase 4 (Intsv.)	66	80%	14	17%		0.0%	3	3.6%	83	100.0%
Total		**435**	**89%**	**31**	**6%**	**11**	**2.3%**	**11**	**2.3%**	**488**	**100.0%**
Sweet potatoes/cassava/taro root/Irish	Phase 1 (Intsv.)	118	80%		0%	16	10.9%	13	8.8%	147	100.0%
	Phase 2 (Intsv.)	127	82%	2	1%	15	9.7%	10	6.5%	154	100.0%
	Phase 3 (Intsv.)	36	67%	7	13%	4	7.4%	7	13.0%	54	100.0%
	Phase 3 (Light)	89	84%	3	3%	9	8.5%	5	4.7%	106	100.0%
	Phase 4 (Intsv.)	109	81%	13	10%	2	1.5%	11	8.1%	135	100.0%
Total		**479**	**80%**	**25**	**4%**	**46**	**7.7%**	**46**	**7.7%**	**596**	**100.0%**
Leafy veg/Salads	Phase 1 (Intsv.)	130	89%		0%	2	1.4%	14	9.6%	146	100.0%
	Phase 2 (Intsv.)	129	87%	2	1%	5	3.4%	12	8.1%	148	100.0%
	Phase 3 (Intsv.)	10	53%	2	11%	2	10.5%	5	26.3%	19	100.0%
	Phase 3 (Light)	77	89%		0%	2	2.3%	8	9.2%	87	100.0%
	Phase 4 (Intsv.)	121	92%	2	2%		0.0%	9	6.8%	132	100.0%
Total		**467**	**88%**	**6**	**1%**	**11**	**2.1%**	**48**	**9.0%**	**532**	**100.0%**
Grand Total		**5460**	**85%**	**262**	**4%**	**316**	**4.9%**	**389**	**6.1%**	**6427**	**100.0%**

Further, most dishes were cooked using a medium pot (Table 11) with a lid (Table 12). The EPC pot is 8 liters which is categorized as a medium pot, and suitable for the customers' needs. Customers had 1 pot for the EPC and was at no point given additional pots.

Table 12: Utensils used to cook dishes (frequencies)

	Phase 1		Phase 2		Phase 3		Phase 3 - Light Clients		Phase 4		Total	
Row Labels	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**		
Sufuria medium	1392	73.2%	1567	73.4%	243	51.9%	1011	71.0%	1130	84.5%	5343	73.5%

Sufuria small	313	16.5%	299	14.0%	208	44.4%	273	19.2%	149	11.1%	1242	17.1%
Sufuria big	183	9.6%	247	11.6%	13	2.8%	127	8.9%	46	3.4%	616	8.5%
Frying pan	14	0.7%	10	0.5%	4	0.9%	9	0.6%	9	0.7%	46	0.6%
Kettle		0.0%	13	0.6%		0.0%	4	0.3%	3	0.2%	20	0.3%
Grand Total	**1902**	**100%**	**2136**	**100%**	**468**	**100%**	**1424**	**100%**	**1337**	**100%**	**7267**	**100%**

Table 13: Use of lid when cooking dishes (frequencies)

	Phase 1		**Phase 2**		**Phase 3**		**Phase 4**		**Total Count**	**Total %**
Row Labels	**Count**	**%**	**Count**	**%**	**Count**	**%**	**Count**	**%**		
Yes	1127	59.04%	1500	70.09%	1193	63.02%	940	70.25%	4760	65.4%
Sometimes	724	37.93%	597	27.90%	646	34.13%	345	25.78%	2312	31.8%
No	58	3.04%	43	2.01%	54	2.85%	53	3.96%	208	2.9%
Grand Total	**1909**	**100.00%**	**2140**	**100.00%**	**1893**	**100.00%**	**1338**	**100.00%**	**7280**	**100%**

3.2.6. Cooking Times

Cooking times of the top 10 dishes using charcoal, EPC, firewood, and gas are displayed in Table 13. Matoke and beans have the longest mean cooking times and generally requires 2+ hours to prepare using charcoal or firewood. Using a gas stove will cut the cooking time in half while using the EPC can cut it down to ¼. These results show great potential for cutting cooking times and fuel expenses by using the EPC to cook dishes that generally require a longer time to cook. From the previous section, the results showed that most customers used the EPC primarily to cook beans, which has the potential to cut the cooking time by ~70%. The majority of participants used charcoal to prepare most of their meals hence this is used to compare efficiency. All top 10 dishes reduced the cooking time by half or more by switching from charcoal to EPC.

Table 13: Mean cooking time of top 10 dishes across fuels/cooking devices

Dish	Charcoal	EPC	Firewood	Gas
Matoke	02:12	00:31	02:19	00:56
Rice	01:05	00:28	00:52	00:45
Beans	02:12	00:41	02:22	00:59
Sweet potatoes/cassava/ taro root/Irish	01:28	00:20	00:52	00:59
Leafy veg/Salads	00:28	00:07	00:17	00:25
Ugali	00:40	00:13	00:24	00:22
Beef/Goat/Meat/Liver	01:43	00:52	01:31	01:04
Groundnuts	01:21	00:30	00:55	00:55
Soup (goat, beef, fish)	01:08	00:57	01:26	00:49
Fried fish/Fish stew/Dry fish/Silver fish/Pasted fish	00:53	00:20	00:36	00:35

Chart 9 shows the time-of-day the participants cooked on charcoal versus on the EPC. There is a similar trend for both, with the peak hours being around 12 PM and 7 PM. The trend for charcoal is slightly more even while the EPC trend is sharper and with nearly 50% of all cooking events recorded at 12 PM.

Chart 9: Time-of-day for cooking with charcoal versus EPC

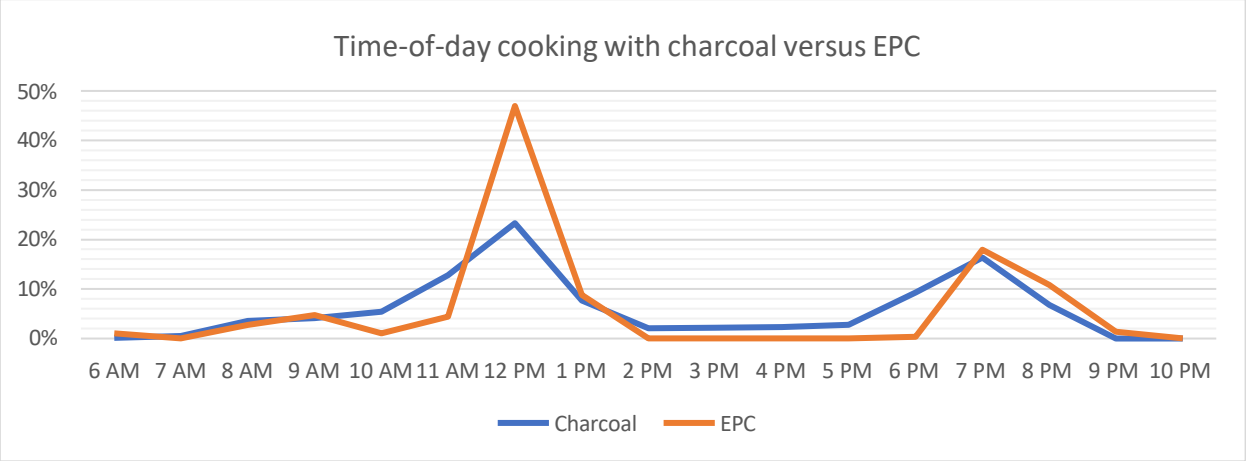
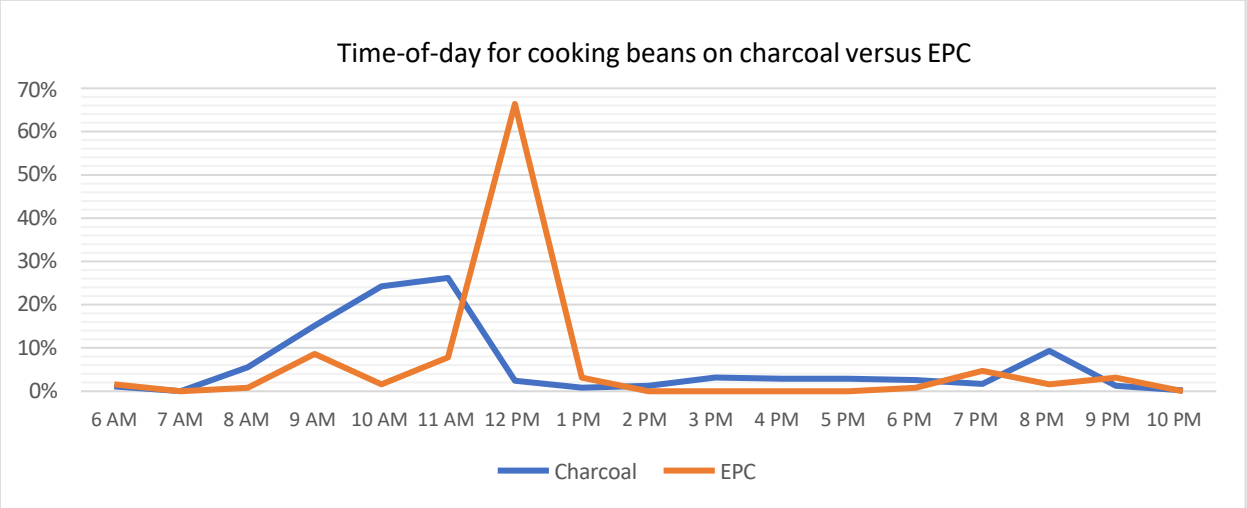


Chart 10 separates the time-of-day beans were cooked on charcoal versus on the EPC. As beans are by far the most popular dish on the EPC it is interesting to see if there are any changes in the participants cooking behavior for this dish in particular. Customers cooking beans on charcoal tend to start earlier in the day, around 10 AM, while those cooking on the EPC are more likely to start cooking at midday. This is likely an effect of the EPC taking a shorter time to cook; hence the beans will still be ready by lunchtime at 1-2 PM.

Chart 10: Time of day for cooking beans on charcoal versus EPC



3.2.7. Water Heating

Out of the participants who heated water as part of a cooking event, 53% heated water twice (or more) per heating event (Table 14). The primary purpose of heating water was for hot beverages (77.9%), and the secondary purpose was for water purifying (18.4%) (Table 15). Charcoal is primarily used for water heating, with gas, EPC, and firewood used occasionally (Table 16). The average heating time using charcoal is around 40 minutes compared to the EPC which takes approximately 10 minutes. The customers are likely using the excess charcoal from preparing a meal to heat the water and do not see the value of switching on the EPC if the charcoal is already burning.

Table 14: Water heating events per meal

Times	Phase 1 (Intsv.)	Phase 2 (Intsv.)	Phase 3 (Intsv.)	Phase 3 (Light)	Phase 4 (Intsv.)	Grand Total
1	49%	35%	98%	52%	49%	47%
2 or more	51%	65%	2%	48%	51%	53%
Grand Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 15: Reasons for heating water

	Phase 1 (Intsv.)	Phase 2 (Intsv.)	Phase 3 (Intsv.)	Phase 3 (Light)	Phase 4 (Intsv.)	Grand Total

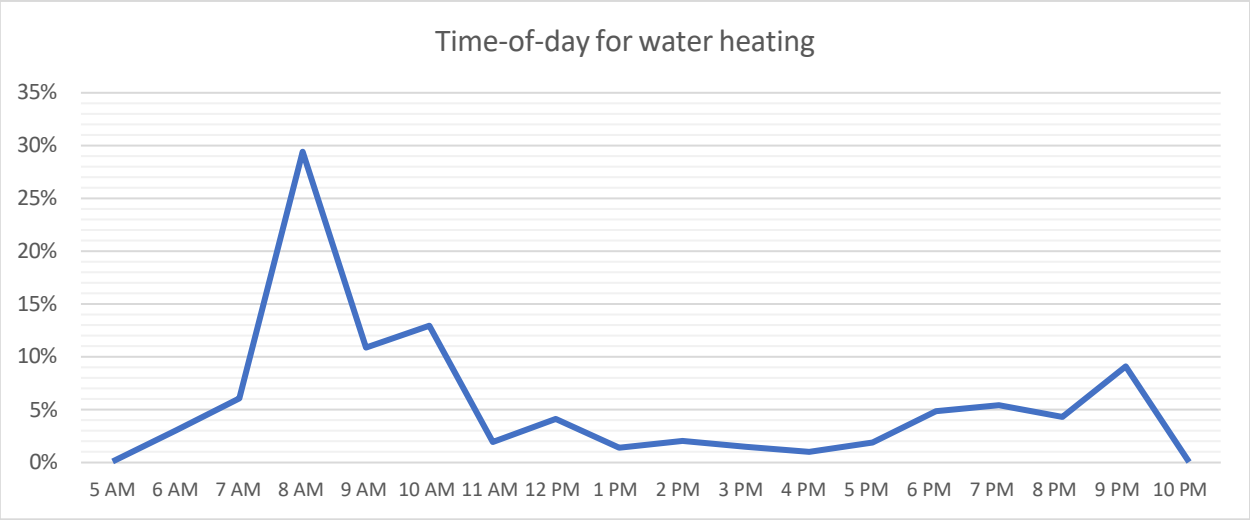
Row Labels	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
Tea/coffee/cocoa /milk	435	77%	562	77%	83	86%	322	79%	321	78%	1723	78%
Drinking/purifying	112	20%	126	17%	11	11%	70	17%	88	21%	407	18%
Bathing	20	4%	39	5%	3	3%	15	4%	2	0%	79	4%
Washing hands		0%	3	0%		0%	1	0%		0%	4	0%
Grand Total	**567**	**100%**	**730**	**100%**	**97**	**100%**	**408**	**100%**	**411**	**100%**	**2213**	**100%**

Table 16: Fuels used for water heating

Phase	Charcoal	Gas	EPC	Firewood	Electric kettle	Kerosene	Electric hotplate	Grand Total
Phase 1								
Count	506	24	0	24	7	5	1	567
%	89.2%	4.2%	0.0%	4.2%	1.2%	0.9%	0.2%	100.0%
Average time	0:42	0:30	0	0:38	0:29	0:53	0:30	0:42
Phase 2								
Count	575	88	20	28	16	1	2	730
%	78.8%	12.1%	2.7%	3.8%	2.2%	0.1%	0.3%	100.0%
Average time	0:38	0:27	0:13	0:38	0:28	0:30	0:40	0:36
Phase 3								
Count	410	20	43	16	7	9	0	505
%	81.2%	4.0%	8.5%	3.2%	1.4%	1.8%	0.0%	100.0%
Average time	0:37	0:34	0:10	0:16	0:40	1:08	0	0:34
Phase 4								
Count	375	15	9	2	10	0	0	411
%	91.2%	3.6%	2.2%	0.5%	2.4%	0.0%	0.0%	100.0%
Average time	0:44	0:31	0:09	1:00	0:29	0	0	0:43
TOTAL								
Total Count	**1866**	**147**	**72**	**70**	**40**	**15**	**3**	**2213**
Total %	**84.3%**	**6.6%**	**3.3%**	**3.2%**	**1.8%**	**0.7%**	**0.1%**	**100.0%**
Total Time	**0:40**	**0:29**	**0:11**	**0:33**	**0:30**	**1:00**	**0:36**	**0:38**

Most events of water heating were early in the morning, which is to be expected seeing as tea (and other hot beverages) are often prepared for breakfast. Approximately 30% of water heating events took place at 8 AM for breakfast, and a smaller peak can be observed in the evening from 6-9PM.

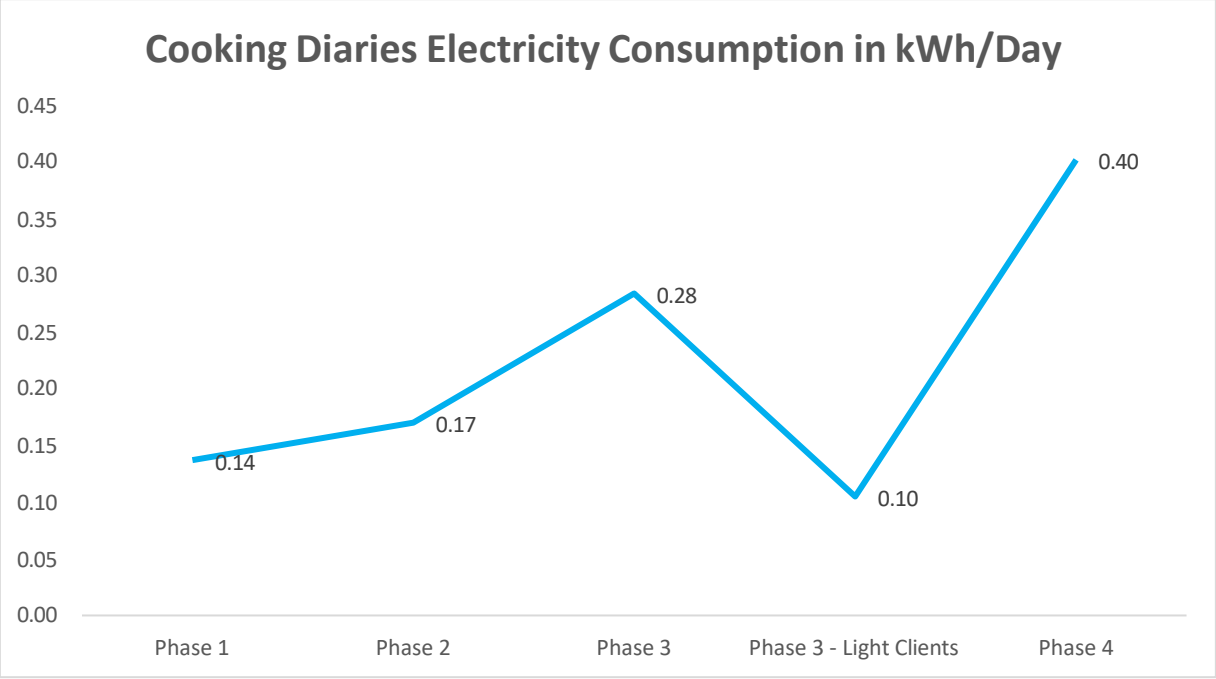
Chart: 10: Time-of-day for heating water



3.2.8. Electricity Consumption

The customers recorded the electricity consumed per dish using their own electricity meters. The average kWh consumed per dish for each phase is presented in Chart 11. At baseline, few of the customers were familiar with cooking with electricity (some had a water kettle, microwave, or rice cooker), hence the energy consumption was only 0.14 kWh. In Phase 3, the energy consumption is much lower for the light customers compared to the intensive customers. Overall, usage of the EPC is concluded to be much higher for customers who were contacted more frequently by the field agents. In Phase 4, the average energy consumption per dish increased to 0.40 kWh which translates to a medium cooking time meal (around 30 minutes) on the EPC (for example rice or ugali).

Chart 11: Electricity consumption per meal (in kWh)



3.2.9. Disclaimer

The list below explains the main challenges faced in the data collection, cleaning, and analysis:

1. **Self-reporting:** The data collection was executed through phone calls with the participants; hence the data is self-reported which should be taken into consideration when reading the results.
2. **Number of entries:** The number of entries is not equal for each participant, as might be expected. During data cleaning, some records contained outliers or errors which needed to be removed to maintain the quality of the analysis.
3. **Missing data:** Some entries have missing data for certain questions which have been removed from the analysis of those variables.
4. **Mealtimes:** The first weeks of collected data did not categorize the dishes into breakfast, lunch, and supper, hence the following timelines were set to determine the mealtimes:

   Table 13: Mealtimes

Meal	From	To
Breakfast	05:00 AM	10:59 AM
Lunch	11:00 AM	03:59 PM
Supper	04:00 PM	11:00 PM

   **The earliest recorded meal was 5:30 AM while the latest was at 10:50 PM.*
5. **Customer fatigue:** During phase 1, the customers were excited and consistent in responding to the cooking diary phone calls, likely because they were offered the EPC without a deposit and were incentivized by having to complete the 3 weeks of calls before receiving the EPC. In phase 2, after receiving the EPC, the participant's motivation started decreasing, and reaching them became more difficult as time went by. To reduce the risk of unsuccessful calls and unfinished surveys, the enumerators would agree with the customer on a suitable time for them to call, both for the daily and bi-weekly calls. The participants were called by the same enumerator each time, which also helped in developing a close relationship where they could ask for help and support on using the EPC.

3.3. Energy Meter

3.3.1. Overview of Data

100 participants (16 intensive/light diary customers and 84 light diary customers) in the Uganda pilot were given an EPC with an energy meter. These units were sold between November 8th 2021, and January 22nd 2022. Out of the 100 participants, data is only available for 74 due to challenges with the meters. Table 14 shows and overview of the units sold, and data collected. December has the most data collected with active EPCs recording every day and the highest number of active households and energy consumption.

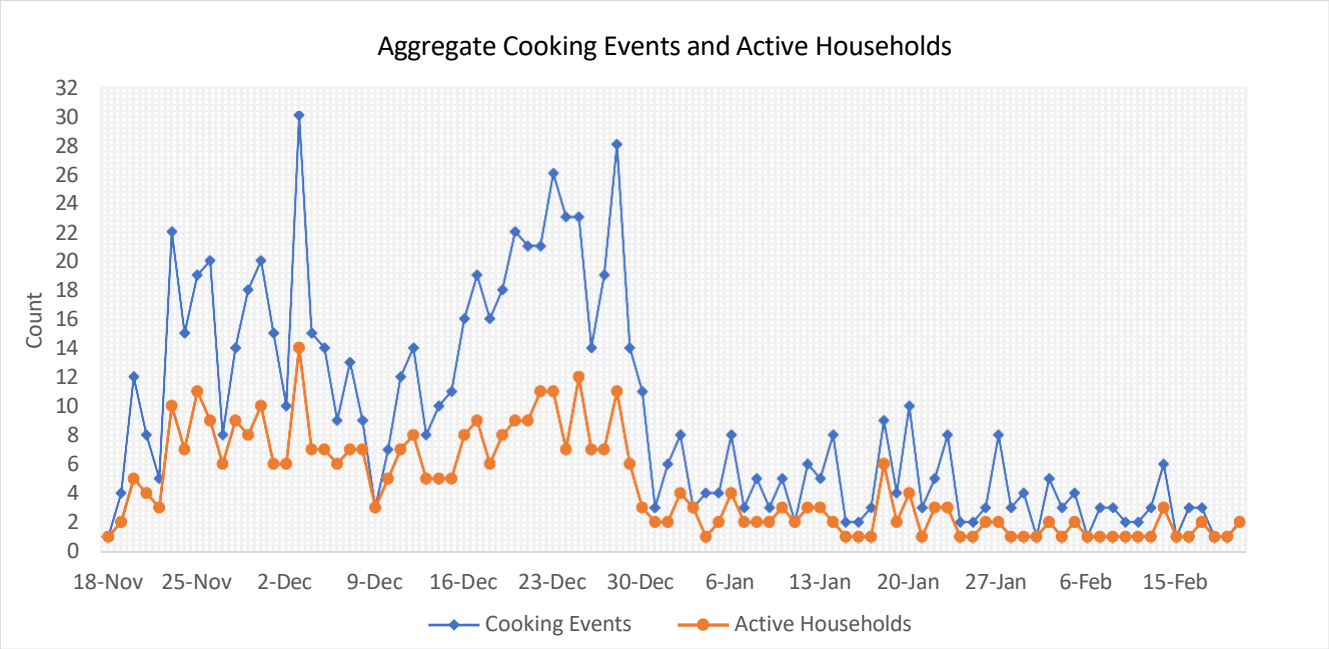
Table 14: Overview of data collected from the EMUs

Month	No. of new units sold	No. of Days with Active EPCs	No. of Active Households	Total No. of Cooking Events	Total Energy in kWh
November 2021	77	14	37	167	39.4
December 2021	15	31	51	474	132.5
January 2021	8	29	16	134	41.9
February 2021	0	17	8	44	11.1

3.3.2. EPC Usage

Chart 12 shows the EPC use over four months from November 2021 to February 2022. There is an increase in EPC usage from November 2021 to Mid-December 2021, correlating with the number of units sold. There is a drop in mid-December before another rise towards the end of the month (Christmas holidays). The highest number of cooking events observed in one day is 30 on December 3rd, with 14 households cooking (~2 cooking events per household). From January 2022 the number of cooking events and household cooking decreased with consistently low numbers throughout February due to the limited data points.

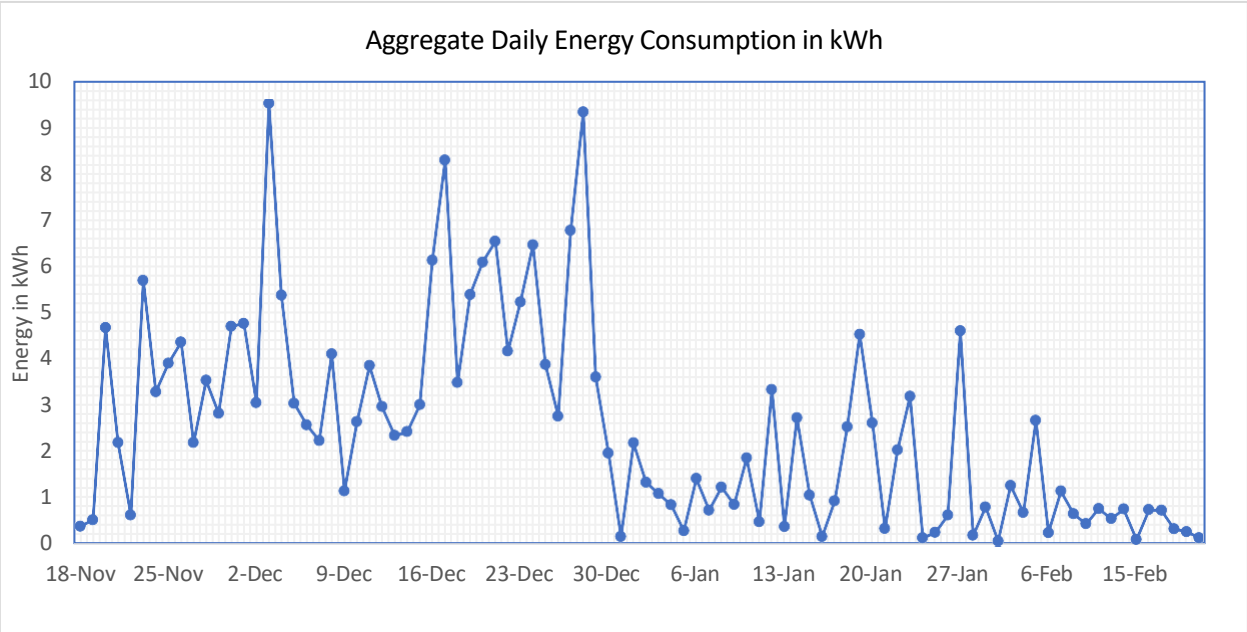
Chart 12: Cooking events and active households from November 2021 to February 2022



3.3.3. Energy Consumption

From November 2021 to December 2021 there is an increasing trend in number of cooking events (as seen in Chart 12) and energy consumption, with a slight drop during the first week of December, then another increase from mid- to end of December (Chart 13). Through January and February 2022 there is a sharp decrease in energy consumption, following the number of cooking events as observed in Chart 12. Considering the results in Chart 12 and 13 and the lack of observations, January and February is concluded incomplete at this time.

Chart 13: Cooking events and energy consumption



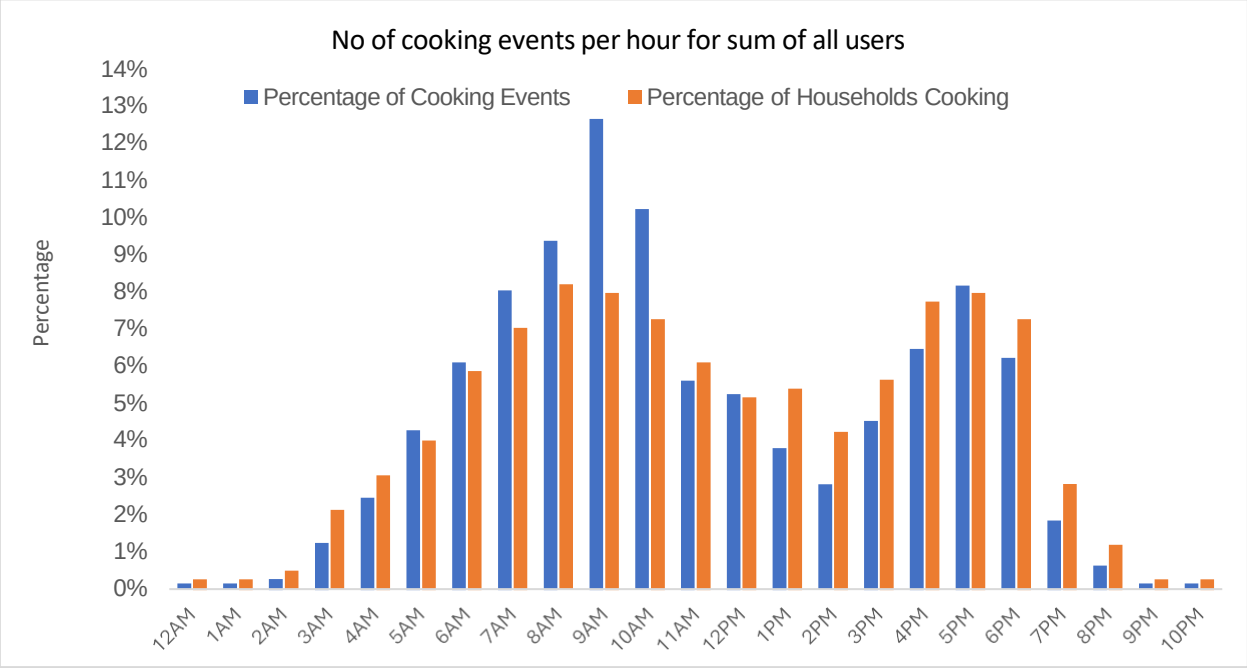
3.3.4. Cooking Times

Table 15 displays the distribution of cooking events across breakfast, lunch, and supper (as per the definition used for the cooking diaries), with breakfast being by far the most popular time for using the EPC (50.5%). Looking at the cooking times in Chart 14 there is one peak at 9AM for breakfast, and another peak at 5PM for supper.

Table 15: Cooking events distribution across mealtimes.

Meal	From	To	Cooking Events Distribution
Breakfast	5:00 AM	10:59 AM	50.5%
Lunch	11:00 AM	3:59 PM	21.9%
Supper	4:00 PM	12:00 PM	27.6%

Chart 14: Distribution of number of cooking events and households cooking per hour for sum of all users



3.3.5. Summary of December Data

December had the highest number of days with activity, number of active customers, number of cooking events and energy consumption (Table 14). Table 16 display an overview of the findings in the dataset for December. The average number of active households per day is 7 and the average number of cooking events is 15 per day. Total energy consumption is 4.26 kWh per day and 0.28 kWh per cooking event, giving an average of 0.61 kWh per customer per day. From the cooking diary data, the average energy consumption per meal was 0.4 kWh, which is not too different from what is seen in the EMU data, keeping in mind that the diary measurements were self-reported.

Table 16: Average number of active EPCs, cooking events, and energy consumption per day in December

December	No of Active Households per day	No of Cooking Events per day	Energy Consumption per day	Energy consumption per cooking event
Average	7	15	4.26 kWh	0.28 kWh
Min	2	3	0.13 kWh	0.04 kWh
Max	14	30	9.50 kWh	0.45 kWh

A customer cooking with the EPC once per day would expect to use on average between 0.2 kWh to 0.5 kWh, which is categorized as a “normal user”. Someone who uses more than 0.5 kwh per day is considered a “high user”, while someone using less than 0.2 kWh per day is a “low user” (Table 17). Most of the participants (44.6%) in the Uganda study belong to the high user category of households who cook with the EPC 1-2 times per day with an average energy consumption of 0.8 kWh per day.

Table 17: User types based on electricity consumption

User	Number of households	Average kWh per day
High: 0.5kwh/day or more	44.6 %	0.8
Normal: 0.2 – 0.5 kwh	29.7 %	0.4
Low: less than 0.2 kwh/day	25.7%	0.1

3.4. Endline Survey

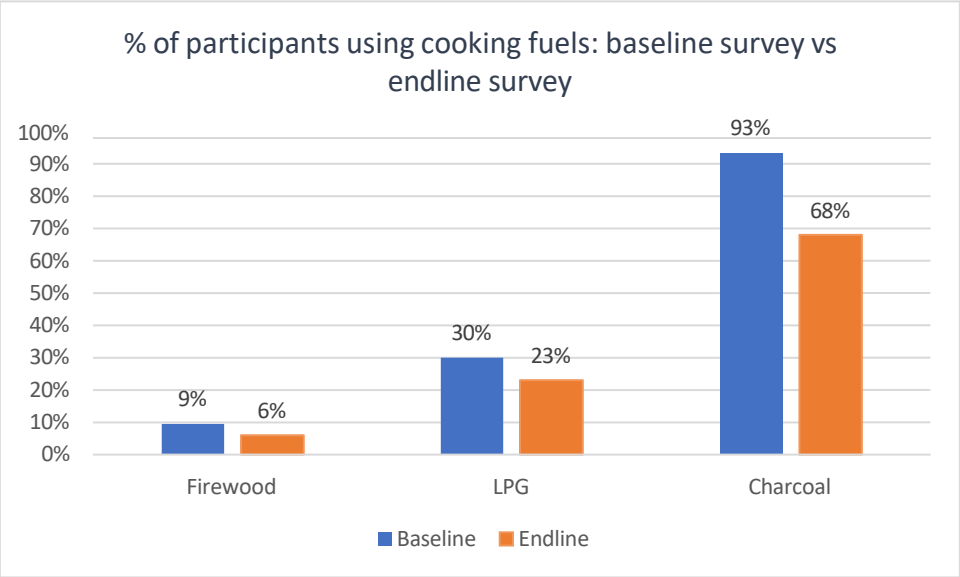
3.4.1. Fuels Used to Cook

The participants were asked at the end of the project which fuels they were still using and only 68% reported using charcoal to cook (reduction of 25% from baseline) (Chart 15). There was also a reduction in the number of participants using both firewood and LPG after receiving the EPC. The key benefits mentioned by the customers for charcoal is that it is readily available (48%) and can cook any local food (31%), while the main dislikes are that it is dirty/smoky (71%) and takes long to cook (17%). 83% describe problems caused by the smoke from charcoal with 40% mentioning respiratory/lung diseases and coughing. Overall, 89% of the participants said they prefer to cook with electricity more than with other fuels.

Figure 3: Customer quote from Rose Auma, Namwongo (pictured cooking fish with her EPC)

When I purchased the Pressure Cooker, I realized I am able to prepare meals faster and on occasions when I return back home late, I can afford to prepare meals like meat and chicken faster, saving a lot of time. In other words, I wouldn't have been able to do the same if I didn't have the pressure cooker. The biggest take away for me has been the time saving, convenience and smart cooking, I no longer worry about returning home late and failing to cook. . I have reduced on my charcoal usage and mostly use Gas (LPG) to prepare my accompanying meals only"

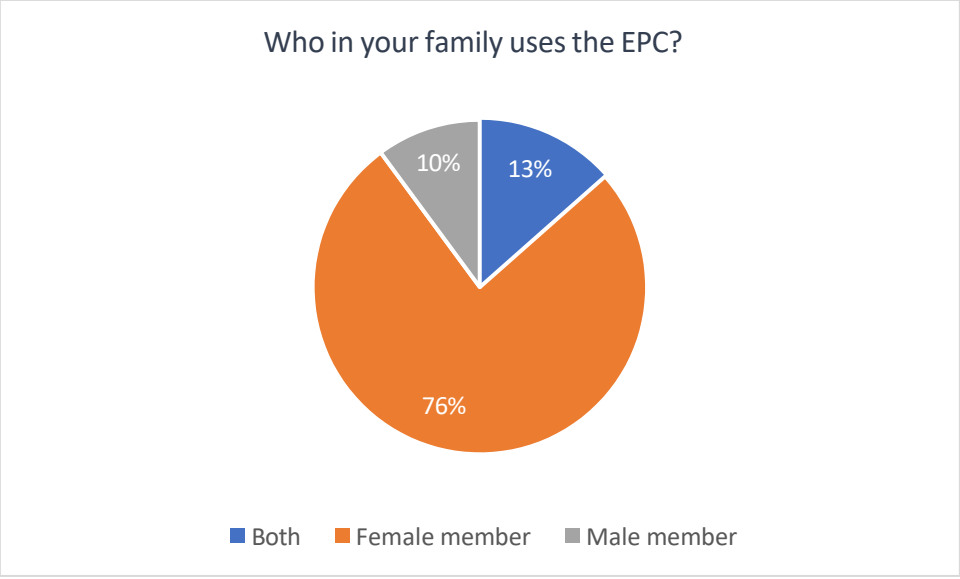
Chart 15: percentage of participants using cooking fuels - baseline survey vs endline survey



3.4.2. Experience Cooking with Electricity (EPC)

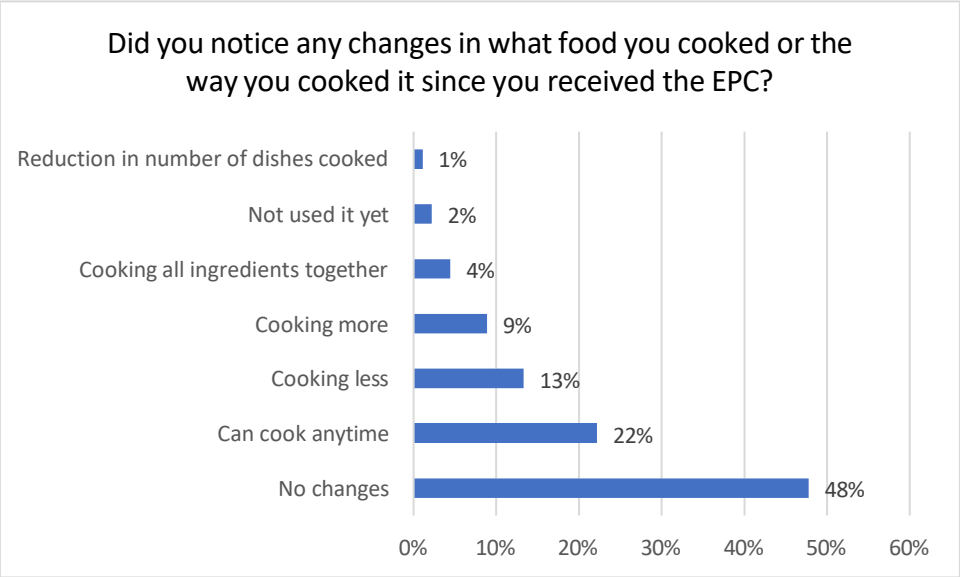
When it comes to operating the EPC, 76% of the households reported that a female member was the primary user, 13% reported both male and female, and 10% reported a male primary user (Chart 16). 66% reported that responsibilities for preparing and cooking food had changed after receiving the EPC, with 45% saying they now received more interest and support while cooking.

Chart 16: Family members operating the EPC



Most customers stated they had not noticed any changes in what foods they were cooking, or the way they cook since receiving the EPC, although 22% mentioned that they could now cook anytime of the day (Chart 17). Learning to adjust the cooking time is the top tip/technique mentioned by the customers. The covid-19 situation has also not affected the customers' cooking (49%); however, some mentioned food was more expensive (18%) and food supply inconsistent (9%).

Chart 17: Changes in foods cooked or cooking habits since receiving the EPC



The EPC is easy and user friendly according to 89% of the customers, and they would not like to make any changes to the appliance (94%). Before cooking with the EPC, some of the participants had concerns about cooking with electricity; primarily it being expensive (51%) and electricity consumption being high (31%). After using the EPC for some time, they like that it is quick and saves time (37%), it is clean (22%), and convenient (19%). A few of the customers still had some concerns about cooking with electricity, the main being that it is expensive (19%), electric shock (19%), and power outages (13%). Power outages is not uncommon, however, 33% said they had not experienced any power outages after receiving the EPC (Chart 18). Those who had experienced it mentioned a frequency of once every 2-3 months (7%), 1-3 times per month (32%), 1-2 times per week (17%), or more frequent (11%). The power outages are usually short, 1-6 hours, and none longer than 24 hours (Chart 19).

Chart 18: Frequency of power outages

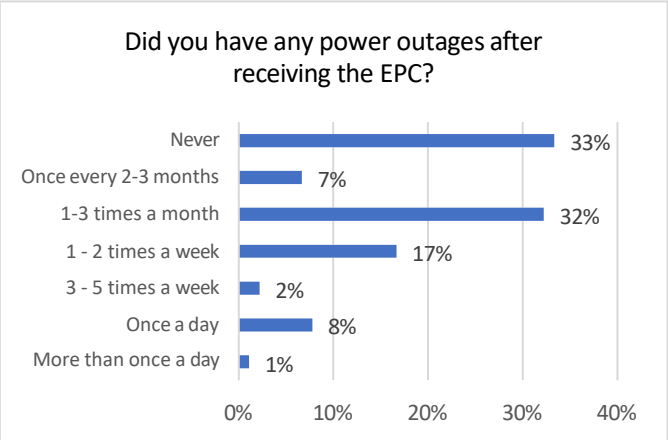
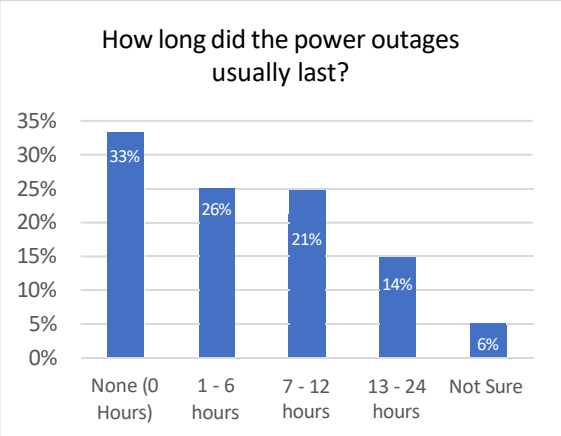


Chart 19: Length of power outages



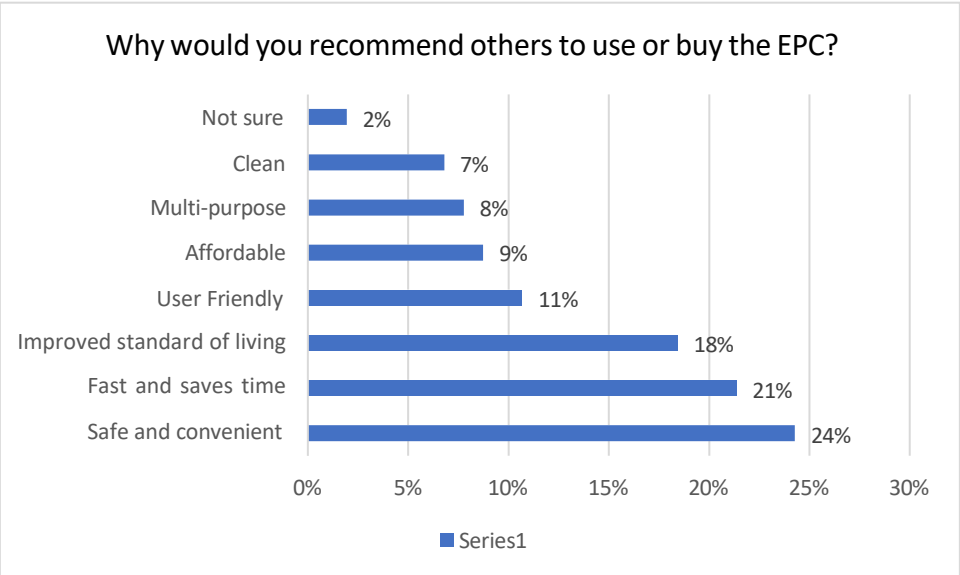
Participants consider cooking with electricity to be safer than other fuels (79%) being that it is more affordable (91%), and cheaper than the fuels they normally use (63%). They also mention having more free time for other activities after cooking with electricity (85%), which most spend on doing house chores

(60%). The main dishes the customers had challenges with cooking on the EPC were cassava (26%), groundnut stew (24%), and matoke (24%). Dishes the customers mentioned taste better when cooked on the EPC were rice (21%), meat (18%), and beans (11%). 97% of the participants said they would recommend others to use or buy the EPC because it is safe and convenient (24%), fast and saves time (21%), and improves the standard of living (18%) (Chart 20). 91% have already recommended the EPC to others and 83% said that others in their neighborhood had inquired about their EPC.

Figure 4: A customer quote from Joshua Agonya, Kisaasi (L); a customer preparing a meal using an EPC (R)

"One of the stand out points that made me decide to buy the EPC was the fact that it wouldn't consume a lot of power, [it is] easy to operate and cooks food faster. Having owned my unit for almost a year now, I received mine in November 2021, … I haven't gotten any challenges with my EPC, it has been working just perfectly".

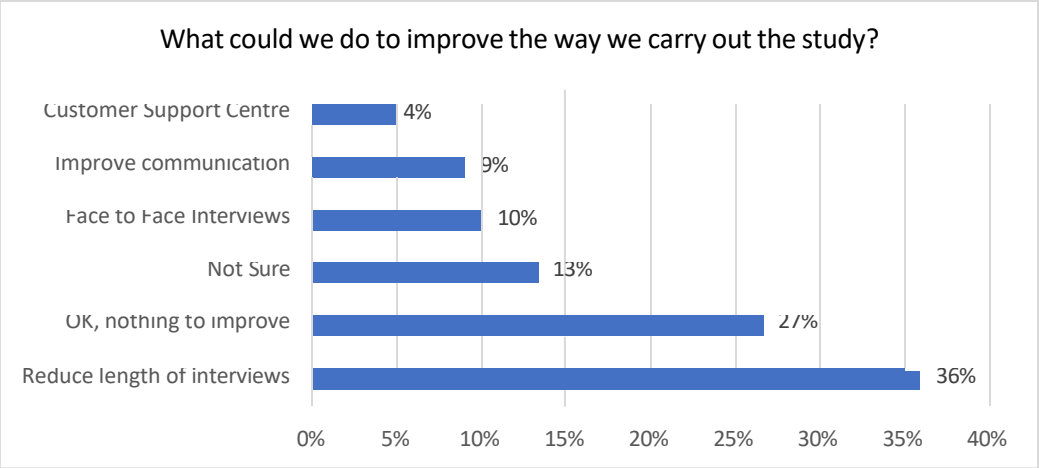
Chart 20: Reasons for recommending the EPC to others



3.4.3. Feedback on the Study

The main feedback received in the study was regarding the length of the interviews (36%). Participants complained throughout the project about both the frequency and length of the calls conducted. The endline survey took 45 minutes and the participants were at this point tired of answering questions from the enumerators. Other than this, there does not seem to be any other major challenges with the study conducted in Uganda.

Chart 21: Participant feedback on the study



4. Lessons learned

4.1 Project Practicalities and Logistics

The most common mode of transport in Uganda is the commercialized use of motorcycles (boda boda) which is a more affordable and timesaving option than a car. The electric pressure cookers were mainly distributed using motorcycles which allowed deliveries to more remote areas that were difficult or impossible to reach by car. For areas that were located a considerable distance outside of Kampala CBD (where the warehouse was located), a semi-truck was used to transport the EPCs. All EPCs were delivered on time and without any damage.

The EPCs were primarily sold during cooking demonstrations where the customers could interact with the product, learn how to cook various dishes, and ask questions about operations and safety. Included in the box was the original instruction manual from the supplier, an instruction manual designed by BURN, a safety flyer, and a recipe book. As the cooking diary data collection was continuous throughout the project the customers frequently interacted with the BURN representatives. This gave an opportunity for them to ask questions, which was particularly useful during the transition phase. The customers could also call the aftersales team whenever they needed support. Some customers also received a house visit if the team felt there was a need for refresher training. The frequent conversations with the customers, as well as the house visits were highly effective in resolving any challenges the customers had and encouraging usage. The customers' concerns were mainly related to safety, however, over time and with support from the team they became more comfortable using and experimenting with the EPC.

As part of the customer's contract, a warranty period of 1 year was included, covering all repairs. Seven customers mishandled the EPC resulting in complete failure of the units.

4.2. Stakeholder Interactions

The key stakeholders in this project were the local partners in Uganda who supported on import, customer acquisition, distribution, and payment collection. Import and sales of the EPCs in Uganda would not have been possible without a local partner. At the peak of covid-19 BURN representatives were unable to travel to Uganda to resolve the challenges and as a result, the project was delayed significantly.

4.3. Scaling up Electric Cooking

Transitioning to electric cooking will be a long-term process as grid connections are expensive to implement. The key requirements for facilitating scale-up would be:

1. Providing support for power load research for mini and micro grids for electric appliances research.
2. Customer education on the cost of electricity and electrical safety
3. Stakeholder engagement with community leaders, local politicians, other players in the e-cooking sector, electricity suppliers, etc.

The EPC is a high price-tag appliance compared to biomass cookstoves, but delivers significant savings in fuel expenses, which ultimately allows the product to pay for itself and deliver long-term savings. Using a more efficient cookstove also allowed women to spend their time on more productive tasks as well as education.

5. Gender

Nearly 550,000 people die prematurely from illnesses related to household air pollution caused by indoor cooking with solid fuels every year in SSA (WHO, 2012). Women and children are disproportionally affected by such health hazards as they are typically the ones tasked with cooking in the household. All BURN stoves, including the EPC, are designed with women in the centre through focus groups, home-placements, and interviews throughout the product development process. BURN's female-led market research team helped guide the direction of the design and continue to follow up closely with BURN's existing customer base.

As the product was already gendered within the context of cultural expectations in East Africa, women and girls were the primary users of the EPCs. BURN included women throughout the planning process – from drafting the Market Research tools to performing the on-the-ground activities and project oversight. Most of our Market Research participants in evaluating design have always been women as they are the primary users.

6. Next steps

The findings of this study demonstrate that energy-efficient modern cooking technologies such as the EPC offer a faster, cheaper, and safer cooking solution to households in Uganda. For long cooking meals (such as beans) in particular, these benefits can be well observed for our customers. In the future, the goal is to develop better material for customer education that can encourage higher usage across a variety of dishes.

Uganda ranks as a market with high potential with ~1.5 million urban, grid-connected households for our electric product suite. With the introduction of the cooking tariff in Uganda, BURN would like to conduct larger-scale pilots in key urban markets in Uganda beyond Kampala to validate our findings at scale. We will also use the findings to iterate our product suite to cater to Ugandan cuisines and customer needs.

These results are useful to the Ugandan government and particularly the Ministry of Energy and Mineral Development as it presents a need to develop an e-cooking strategy that will facilitate an overall shift from the use of biomass which is presently predominant in Uganda. The findings are also key to UMEME, the primary electricity distributor to stimulate demand for electricity surplus through e-cooking.

7. Conclusion and Recommendations

7.1. Conclusion

BURN is confident that the electric pressure cooker, developed for the SSA market, is well-positioned for success in Uganda. EPCs provide consumers with increased energy efficiency as compared to traditional cooking methods, and significant time savings which allow the users to multitask on other activities.

Uganda has a relatively low social tariff for electricity at $0.07 per kWh, however, the limit on consumption is set to 15 units, meaning that if a customer consumes above the 15 kWh limit their cost per unit increases to $0.19. Someone who only uses a lightbulb in their house would typically consume around 15 kWh per month. Considering that the EPC is a low energy consuming appliance it fits well with the Ugandan market where the price of electricity is slightly higher than in other SSA countries. Cooking with the EPC 3 times per day would consume around 2 units (depending on the meals cooked). At $0.19 per unit, this is a far more economical option than other fuels such as charcoal which is selling at $0.28 per kg (2021).

The most cooked dishes in the study were matoke, rice, and beans, respectively, which together accounts for close to 50% of all dishes cooked during the study. At the end of the project, beans was by far the most popular dish on the EPC with 46% of all cooking events. Cooking beans is a time-consuming activity, taking around 2-3 hours, and the process is often started in the morning to prepare for lunch. On the EPC, the participants could start cooking at noon and spend the morning hours on other activities. With 76% of households reporting that a female member is a primary user the potential benefit of increased uptake is even larger for women who are disproportionally affected by health hazards related to traditional cooking and spend a large portion of their time on cooking activities.

Although the participants said they found the EPC easy and user-friendly, it became clear to BURN that they could benefit from more encouragement and training on how to adapt local dishes to be cooked on the EPC. Dishes the customers mentioned taste better when cooked on the EPC were rice (21%), meat (18%), and beans (11%) - which requires minimal changes to the recipes. The main dishes the customers had challenges with cooking on the EPC were cassava (26%), groundnut stew (24%), and matoke (24%) – which requires more adaptation. Customers are seeing the health and safety benefits as well as timesaving and convenience and hopefully over time, and with more intensive training, the adoption rate will be even higher.

7.2. Challenges and Recommendations

Overall, BURN experienced two major challenges on this project – partially outside of our control. Working with partner organizations is always a risk seeing as responsibility is put in the hands of someone whose

interests may not align with yours. The covid-19 situation did not make the situation easier, and not being able to travel to Uganda to resolve urgent issues contributed to the delay of the project. Additional implications of covid such as lockdown, people traveling to their villages, and financial constraints further complicated the roll-out of the pilot. For future pilots in Uganda, BURN will have direct management of the project on the ground using a BURN entity to control all aspects of the project from planning, implementation, follow-up, data collection, payment collection, and customer care.

The second challenge of this project was related to the data collection, specifically the cooking diaries. Before receiving the EPC, the customers were excited and consistent in responding to the cooking diary phone calls. After receiving the EPC, the participants' motivation started decreasing and reaching them became more difficult over time, even when offering incentives such as airtime or mobile money. However, by the time BURN was conducting the endline survey most customers could not be motivated to participate.