13TH EGERTON UNIVERSITY INTERNATIONAL CONFERENCE

Response to clean cooking energy and willingness to pay for solar electric pressure cooker unit by low and middle-income households in Nakuru County, Kenya

CLEAN COOKING ENERGY: OPTIONS AND ASSOCIATED COSTS

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Media of Africa for Africa

BACKGROUND

- Approximately 3.6 billion people globally rely on solid biomass such as wood, charcoal, crop residue, coal, and animal dung for meeting daily cooking needs in inefficient and poorly vented combustion devices like open fires (johnson et al., 2020).
- In Kenya alone, over 70% of the population (about 9.3 million households) use solid bio-fuels on traditional cook stoves while only 3% own electric cooking appliances.
- The impact of solid biomass fuel for cooking on households has been far reaching worldwide.
- Overreliance on solid biofuels adversely impacts the respiratory health of using families through hap.
- In 2018, HAP was estimated to be responsible for 1.6M premature deaths worldwide. In Kenya alone, 21,650 children below the age of 5 succumb to HAP (GBD risk factor collaborators, 2018; johnson et al., 2020)

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- Additionally, traditional cooking piles pressure on natural resources leading to environmental degradation, resource depletion & accelerated climate change through black carbon emissions and CO_2
- Furthermore, women and children continue to disproportionately experience the burden of traditional cooking through firewood collection and cooking.
- Surprisingly, households that purchase fuel for use in poorly vented cook stoves have much higher annual fuel costs than those who use efficient technologies.
- Besides, efficient cooking technologies have the potential to make substantial contribution to income & other economic activity-as they have potential to reduce emissions, reduce health and climate impacts.

Statement of the Problem

- In an effort to address the misgivings of unclean cooking, the government of kenya has implemented a # of measures in line with SDG 7 and 13;
- 1st, gvt introduced zero tax on LPG cylinders and duty free importation of solar and solar products
- 2nd gvt. Is continuing with mass rural electrification programmes- by 2018, access to electricity in Kenya was at 75% with KPLC boasting of over 6m customers countrywide.
- Despite the concerted efforts and increased electricity connectivity, few households (> 3%) use electricity as their primary fuel nationally.
- Weak grids, load shedding, affordability of electricity, accessibility of liquid petroleum gas (lpg), tradition, perception and inadequacy of suitable cooking appliances all act as barriers to scaling up the use of electricity as a cooking source.
- Therefore, any initiative towards overcoming these barriers is cardinal. It was on the foregoing, that a consortium of SCODE (Sustainable Community Development Service) and Egerton University conducted a study to evaluate the performance of electric solar pressure cookers in low and medium households in Nakuru county.

OBJECTIVES

- To develop a d.C solar electric pressure cooker unit in the workshop suitable for cooking.
- To test and evaluate the performance of the developed DSEPC.
- To evaluate potential for adoption of the DSEPC unit in the target communities using KPT & CCT.
- Investigate consumer financing models for DSEPC suitable for target households
- To assess the affordability of the DSEPC unit to the potential users

METHODOLOGY

- Purposive Sampling Technique Was Employed
- 516 Households Were Interviewed
- DSEPC Prototype Was Assembled
- CCT And KPT Were Conducted In The Workshop
- KPT In Communities

RESULTS AND DISCUSSIONS;

CONSUMER'S HOUSEHOLD AND INSTITUTIONAL CHARACTERISTICS

Location	Variable						
	Age (years)	Gender		Schooling years	Monthly income (KES)	Group membership	Distance to source of fuel (Km)
		Male	Female				
Mbaruk	49.84	67.62%	32.38%	8.37	7896	69.67%	1.05
Mogotio	42.98	71.32%	28.68%	7.78	7415	51.47%	2.23

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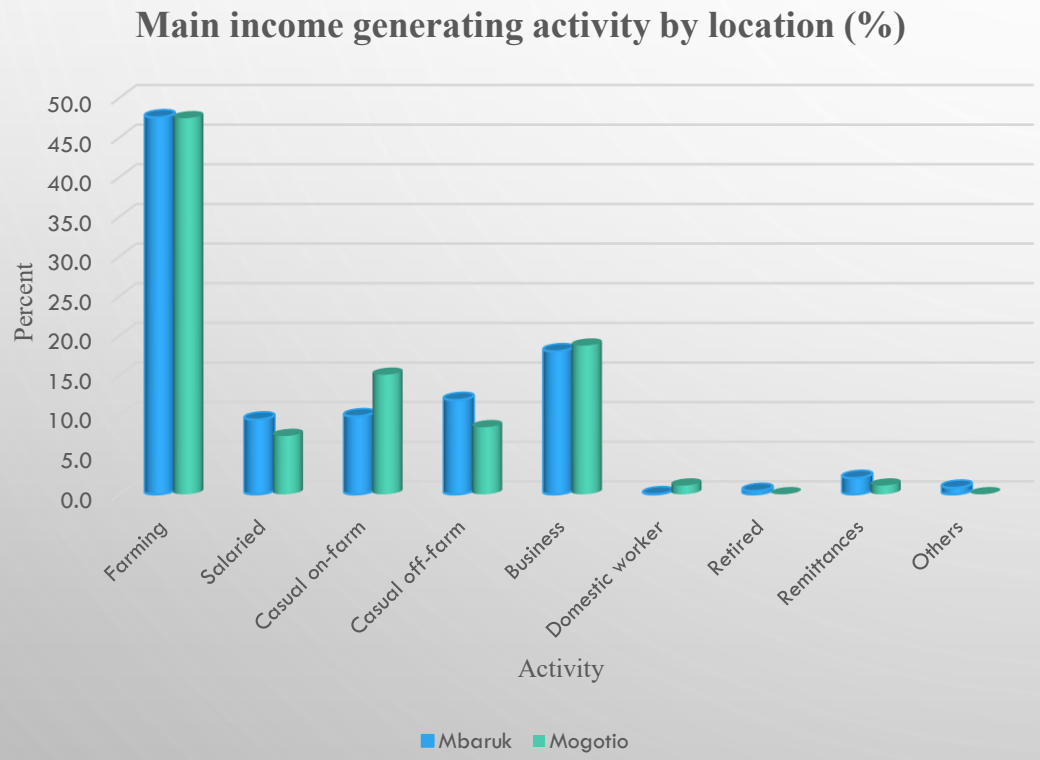
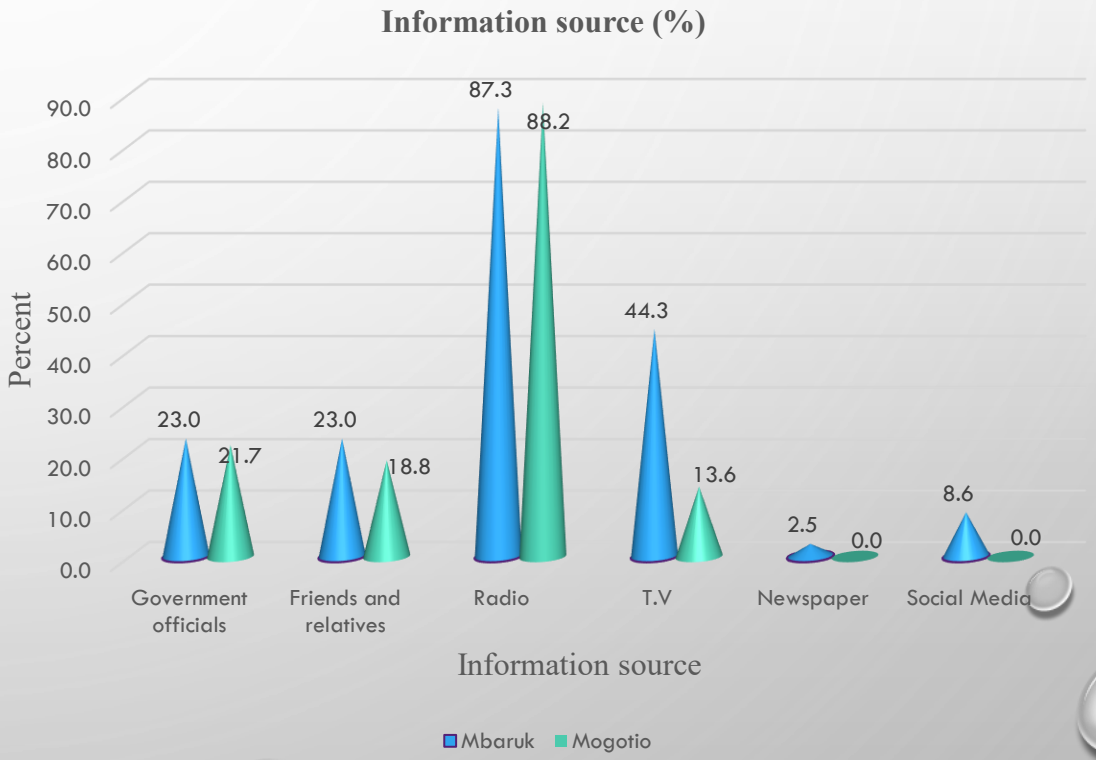

Main income generating activity by location (%)
Percent
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Farming
Salaried
Casual on-farm
Casual off-farm
Business
Domestic worker
Retired
Remittances
Others
Activity
Mbaruk
Mogotio

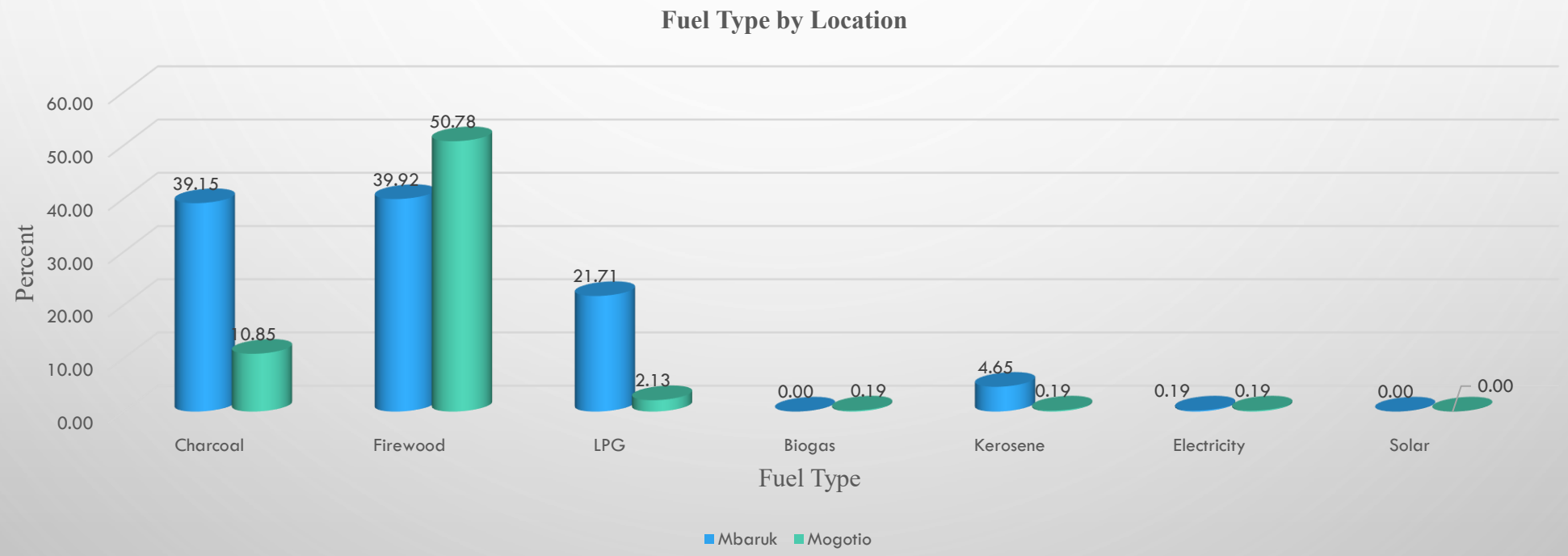

Information source (%)
Percent
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
23.0
21.7
23.0
18.8
87.3
88.2
44.3
13.6
2.5
0.0
8.6
0.0
Government officials
Friends and relatives
Radio
T.V
Newspaper
Social Media
Information source
Mbaruk
Mogotio

INFERENTIAL STATISTICS

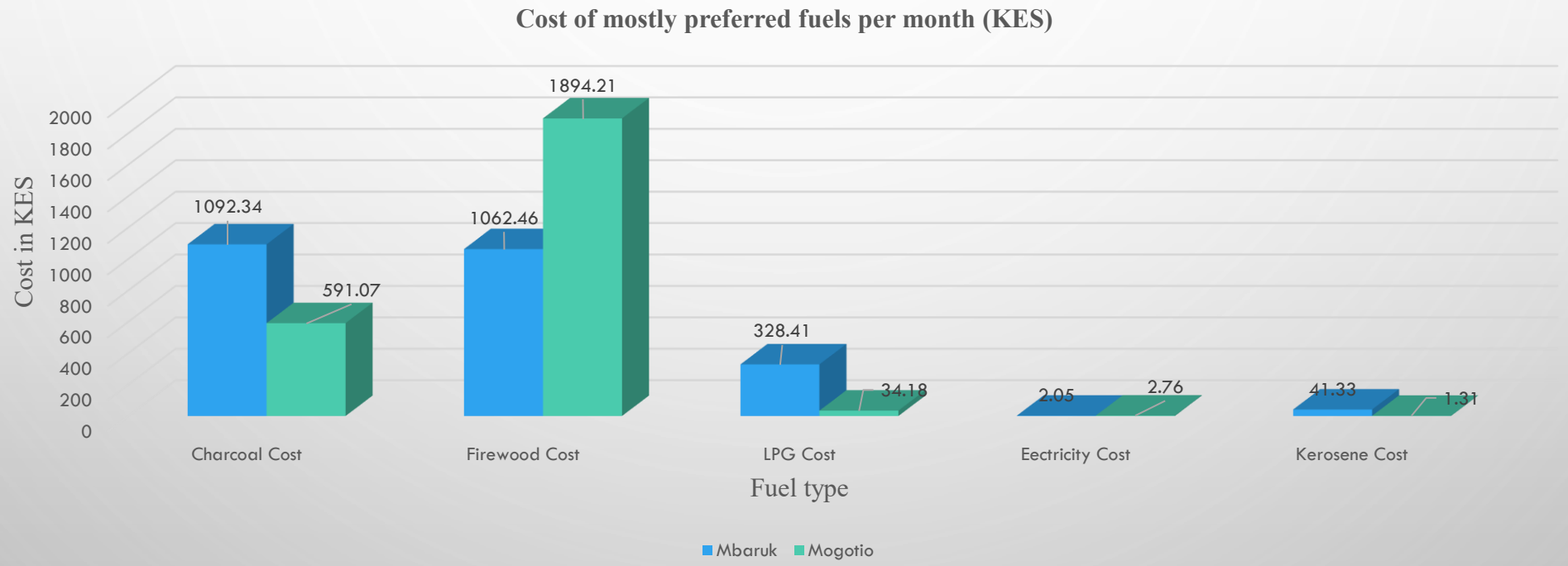
Variable	Description	Willing to pay	Not willing to pay	Chi Square
Gender	Male Female	66.19 33.81	83.33 16.67	11.6440***
Health Issues	No Yes	53.33 46.67	82.29 17.71	27.0331***
Location	Mbaruk Mogotio	51.67 48.33	28.13 71.87	17.3734***
Energy source	Electricity Solar Both Others	22.86 31.67 1.90 43.57	12.50 25.00 2.08 60.42	9.9064**

Variable	Willingness to pay	Mean	Std. Dev	t-stat
Age	No Yes	46.92 46.07	14.17	0.5284
Household Size	No Yes	5.55 5.49	2.54	0.2265
Schooling years	No Yes	6.97 8.31	3.86	-3.0934***
Children Under 5 years	No Yes	4.58 9.74	1.54	-4.0074***
Disabled members	No Yes	0.10 0.70	0.34	-1.7847**
Members with Health Issues	No Yes	0.30 0.76	0.96	-4.2454
lnlogIncome	No Yes	8.51 8.63	0.81	-1.3102*
Time to get fuel	No Yes	85.38 105.94	73.90	-1.9143**
Fuel cost	No Yes	1543.37 2749.59	1295.68	-2.0280**
Main Occupation	No Yes	2.65 3.01	1.93	-0.5156

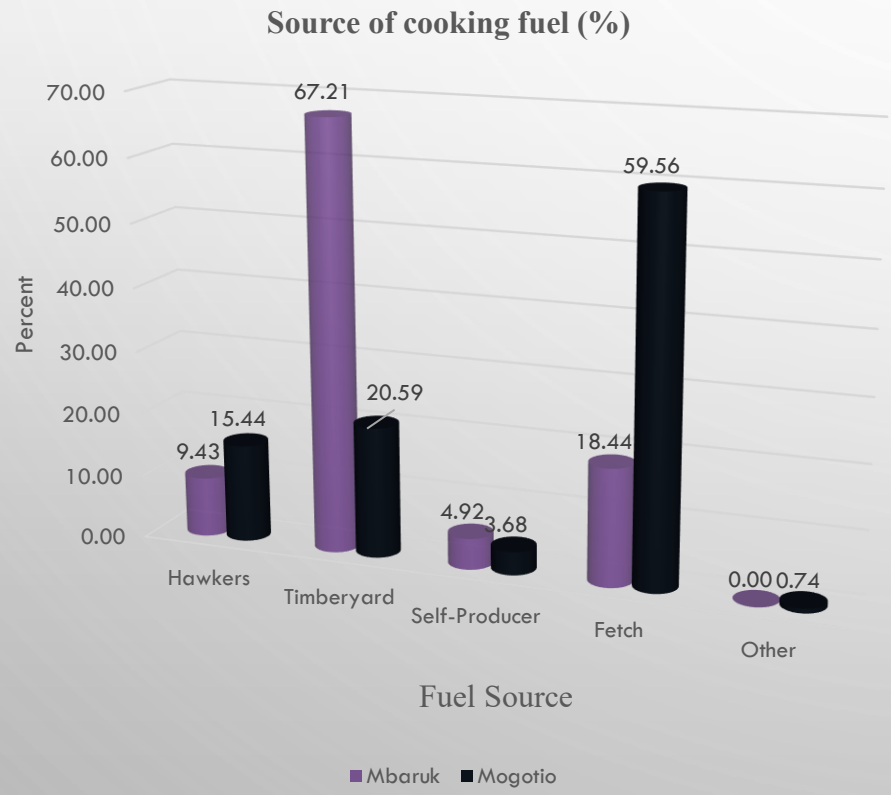
TYPES OF FUEL BY LOCATION



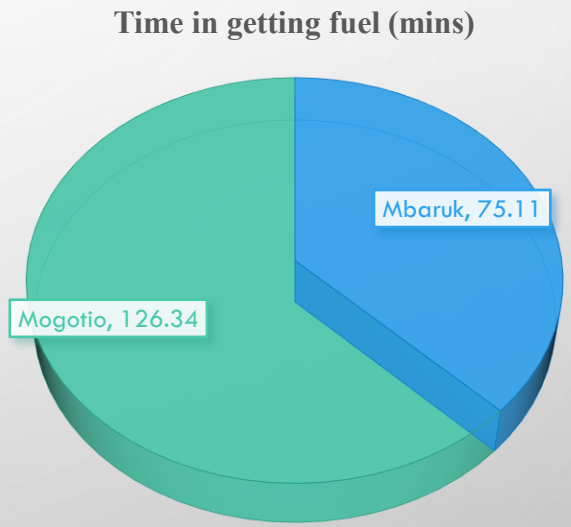
MONTHLY COSTS OF MOSTLY USED FUELS



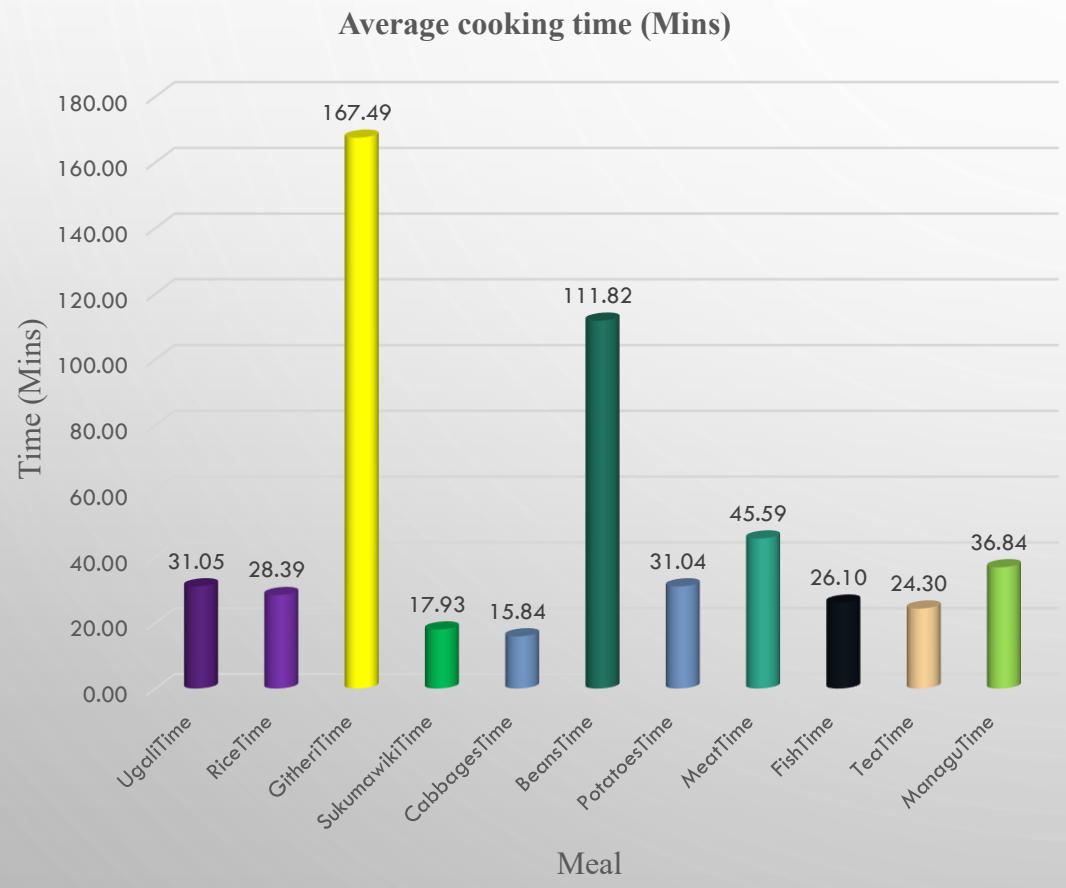
SOURCE OF COOKING FUEL



AVERAGE TIME SPENT GETTING COOKING FUEL



AV. COOKING TIME

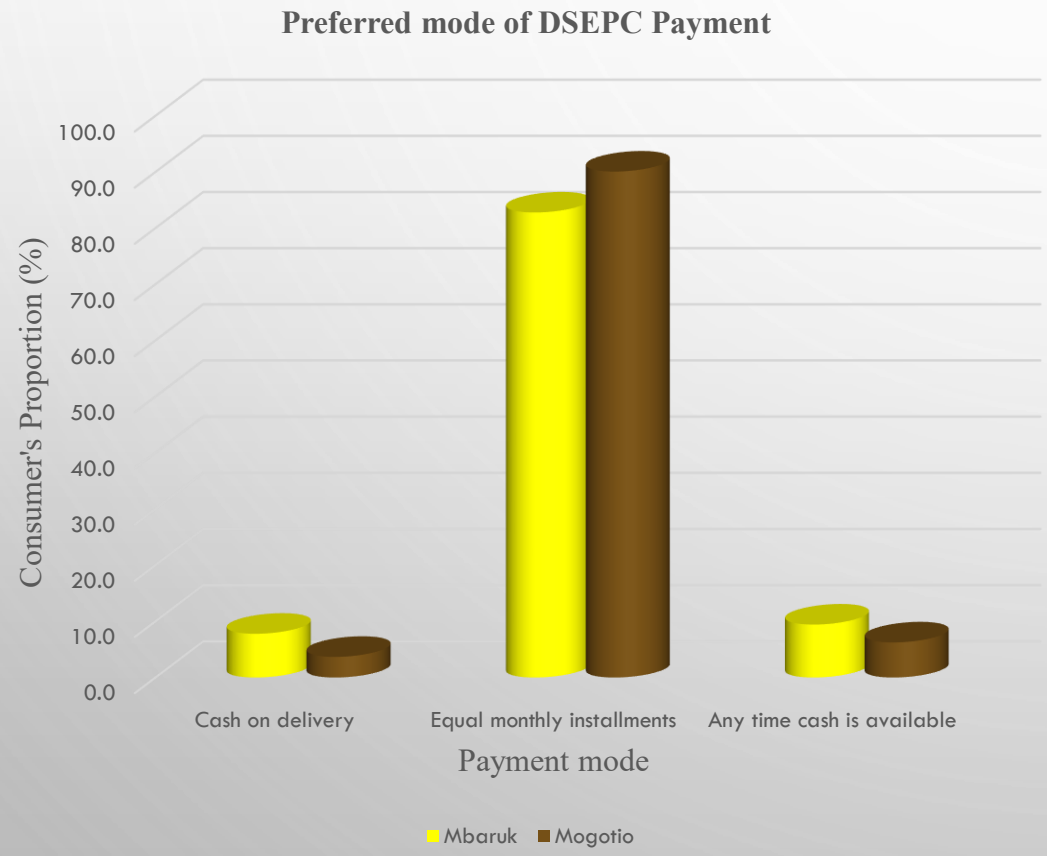


Mean energy and cost before and after intervention

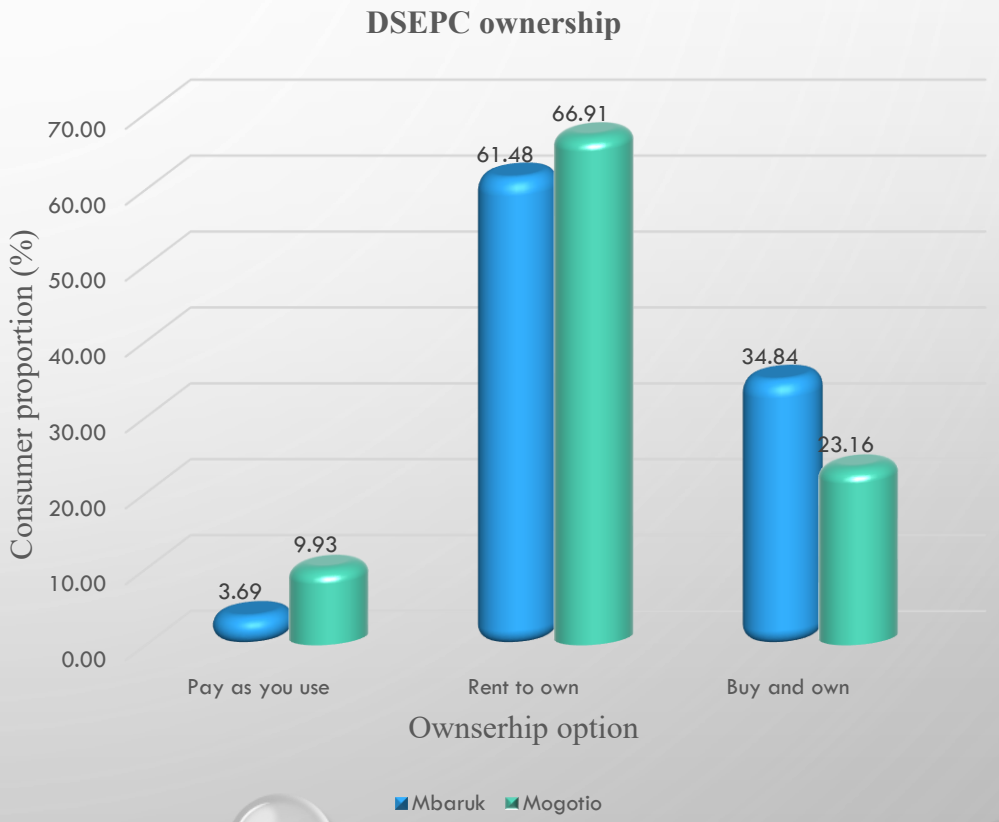
	BEFORE INTERVENTION		AFTER INTERVENTION	
HHID	Mean Energy Used	Cost of Energy in Ksh	Mean Energy Used	Cost of Energy
24.00	55.67	244.35	5.85	25.68
25.00	80.29	352.40	13.48	59.18
27.00	24.80	108.84	17.20	75.50
28.00	6.37	27.96	1.65	7.23
29.00	30.96	135.88	13.51	59.31
30.00	6.40	28.09	22.31	97.90
31.00	10.72	47.05	12.82	56.28
32.00	12.80	56.18	10.92	47.93
33.00	8.00	35.11	13.15	57.70
34.00	6.88	30.20	9.15	40.16
35.00	90.74	398.23	21.18	92.96
37.00	8.32	36.52	7.36	32.29
MEAN	**68.35**	**299.97**	**14.47**	**63.50**
STDEV	**114.17**	**501.06**	**7.17**	**31.46**

T-test = 0.0035 < 0.05

Mode of payment for the DSEPC



Ownership preference



ECONOMETRIC ESTIMATION OF CONSUMERS' WILLINGNESS TO PAY FOR THE EPC

Factors influencing consumers' willingness to pay for the EPC (Probit model estimates)

Variable	Coefficient	Std. Err.	Z	P>z
Consumer characteristics				
Age	0.00904	0.00598	1.51	0.130
Gender	0.53511***	0.16792	3.19	0.001
Schooling years	0.06901***	0.02204	3.13	0.002
Household Size	-0.0598*	0.03230	-1.85	0.064
Children under 5 years	0.25958***	0.08155	3.18	0.001
Members Disabled	0.89366	0.55758	1.60	0.109
Members with HIs related to cooking	0.36118***	0.08747	4.13	0.000
lnlog Income	0.05484	0.09286	0.59	0.555
Main occupation	0.01352	0.01597	0.85	0.397
Cooking characteristics				
Energy source	-0.0036**	0.00158	-2.30	0.021
Cooking time	0.00559	0.00678	0.83	0.409
Cost of cooking fuel	0.00026***	0.00060	4.36	0.000
Institutional characteristics				
Group membership	-0.0398	0.15112	-0.26	0.792
Time taken to get fuel	0.00223**	0.00101	2.22	0.026
Probit regression model		No. of obs	=	509
		LR Chi2(14)	=	104.63
		Prob > Chi2	=	0.0000
Log likelihood = -194.14142		Pseudo R2	=	0.2123

CONCLUSION & POLICY IMPLICATION

CONCLUSION

- Around 2 hours is spent fetching or collecting firewood
- Cost of solid biofuel is much higher than cost of clean cooking energy
- Clean cooking energy is efficient and faster as compared to solid biofuels

POLICY IMPLICATION

- Increased uptake of clean cooking energy eases the burden of collecting and purchasing firewood on women and girls- more time for economic activities, social participation, and education
- Reduced pressure on environmental resources hence substantive contribution to 2015 Paris agreement on climate change

Thank you