Households' Electricity Access Challenges and Coping Strategies: A Reference to Informal Settlements in Addis Ababa

Nibretu Kebede* ***Degefa Tolossa***** and ***Tamirat Tefera******

Abstract

Lack of access to adequate, reliable, sustainable and affordable electric power presents numerous socioeconomic challenges to households in informal settlements. The data for this study was captured from households in Addis Ababa (Yeka Sub-city, Woreda[7] 12) and analysed using descriptive statistics and binary logit model. The study showed that households have very low and unstable income, live in unauthorized and scattered settlements, lack access to adequate electric supply, and required to pay unaffordable connection fees and electric bills. These challenges forced them to take energy conservation and coping strategies, change food consumption behaviours, and proposed policy options. The study results revealed that households' willingness to share the cost designed to improve electric supply increases with the increase in family size, the decrease in the number of years lived in the area, reduction in the number of meals per day, high interest to get legal land title and electric counters, and if households are currently non-users of energy efficient stoves and power saving lamps. Households positively respond to electric tariffs revised based on energy source, the location of the residence place, and seasonal variations in power supply. The willingness to use temporary and less power consuming electric services by 93% of non-users of electricity and share electric meters in groups associated with high connection fees by 73% could also be used to solve households' challenges to access electricity.

Keywords: Household electricity access; challenge; coping strategy; electric tariff, informal settlement; Addis Ababa

* PhD candidate, Center for Environment and Development, College of Development Studies, Addis Ababa University, E-mail addresses:nibretud@gmail.com **(Corresponding author)**

** Professor, Geography and Development Studies, Addis Ababa University, E-mail: degefatd@gmail.com

*** Assistance professor, Center for Environment and Development, College of Development Studies, Addis Ababa University, E-mail:tamirat1995@yahoo.com

1. Introduction

Access to electricity is essential for basic human needs and improves the socio-economic life of households in developing countries. It improves the health and education services, water supply, the environment, family income, saves energy expenditures, and speeds up households' energy transition (WB, 2014; Sanaeepur, *et al.,* 2014; Getachew, 2018; Torero, 2015). As described by FAO (2015), it plays a key role in achieving food security, better nutrition and influence food prices. As a result, providing affordable, reliable, sustainable and clean energy for all in 2030 has become an agenda of sustainable development goals (SDGs) (UNDP, 2015; World Bank and IEA, 2017).

However, many people refer access only to availability and this concept does not capture the adequacy, reliability and affordability of electric service. Pueyo and Hanna, (2015) and Padam, *et al.,* (2018) described energy access as availability, adequacy, reliability, affordability and convenience to use. It includes the number of people connected to electricity, the length of time electricity is available, amount of energy consumed per annum, legality and cleanness of energy sources (IEA, 2012; WB, 2015; UNESCAP, 2019).

In Sub Saharan Africa a large group of population lacks access to electricity, a quarter of those live in urban areas (where the majority are informal settlers) and a person on average consumes as little as 200 kWh per year against 1,442 kWh in North Africa in 2016 (Hafner, et al., 2018; Arlet, *et al.*, 2019). In the region, the share of electricity from the total energy consumption is as low as 4%, the rate of electrification in 2017 was not higher than 43% and the average annual electric consumption is 521 kWh (IEA, 2012; Hafner *et al.,* 2018). This is due to absence of technologies, unstable income, cultural acceptance of alternative cook stoves, households limited capacity, lack of sufficient credit facilities for energy saving stoves in informal settlements and inability of energy suppliers to recover operating costs with the existing electric tariffs (REEEP Secretariat, 2012; UNDESA, 2014; Middlemiss and Gillard, 2015).

In Ethiopia, although the country has high potential to produce electricity (over 60,000 MW, 86% from hydropower, 8% from wind and solar energy, and 6% from geothermal), as of when it generates only 4,284 MW from all sources (7.14% of the potential) to serve over 117 million people (Power Africa, 2016; EEP, 2016; MWIE, 2017; WPR, 2021). Currently, about 45% of its population has access to electricity and the per capita electric consumption is about 85-100 kWh per year while the standard set is at least 250 and 500 kWh for rural and urban, respectively (IEA, 2012; MoWIE, 2015; Hafner *et al.,* 2018).

Since informal settlers are found in an area between the urban centre and the cultivated edge of rural areas, unauthorized and unplanned land that is not zoned for residential purpose, and hence they lack legal entitlement to access energy providers and those who had access to electricity have faced with frequent power interruption, fluctuation, outages and sometimes oversupply (Butera *et al.,* 2016; Subbiah *et al.,* 2016; Majale, 2002). They are economically poor, earn irregular income, and live in poor housing and created by the inability of the economy to supply housing for the low income groups (Gaunt *et al.,* 2012; Luhar, 2014; Onyekachi, 2014; Dadzie, *et al.,* 2018). These situations forced them to relay on traditional energy sources emitting high carbon monoxide and smoke, produce less fire and use inefficient stoves (Yu *et al.,* 2008; Karatasou *et al.,* 2014).

On the other hand, energy suppliers are not willing to make additional investments in informal settlements mainly due to households' socio-economic backgrounds, low electric consumption and unreliable demand patterns, electric tariffs that are not cost-reflective and encourage households take energy conservation strategies and minimize peak-time electric consumption (Millsa and Schleich, 2012; Karatasou *et al.,* 2014; Figueroa, 2016; Lia and Just, 2018; Arlet *et al.,* 2019; Chowdhury *et al.,* 2019; Bayera *et al.,* 2020). The government slowed dawn the expansion of electric supply in informal settlements by giving less attention to off-grid electric expansion, failure to involve the private sector in energy supply, and by designing electric access programs (such as Rural Electrification Program-REP and Universal Electricity Access Program-UEAP) that do not cover Addis Ababa (Getachew, 2018). Increasing demand for energy,

insufficient finance, the need to subsidize electric power and energy-efficient devices on the one hand and lack of small-scale technologies on the other, and integrating them with carbon reduction frameworks are also the major challenges to energy suppliers (Karatasou *et al.,* 2014; Grueneich, 2015; Barnes *et al.,* 2016; Blair *et al.,* 2019). These factors together with lack of integrated urban planning influence the power supply to households in informal settlements and enhance inequalities in income among citizens.

To deal with such problems Zarnikau *et al.,* (2015) and Kuhn *et al.,* (2016) proposed the need to decentralize electric generation, storage and supply systems at local levels, reach individual homes through rooftop solar energy systems, and large-scale intermittent generation and grid distribution systems. But these systems require a thorough analysis of the financial viability of energy sources to the energy supplier, the socio-economic backgrounds and settlement patterns of households in informal settlements.

Woreda 12 of Yeka sub-city is one of those areas in Addis Ababa where large numbers of informal settlers suffer from lack access to electricity. The objective of this paper, therefore, is to assess households' challenges to access electricity, the socio-economic backgrounds affecting energy consumption levels and their coping strategies. It captured the reasons for households' lack of access to electricity, the length of time households requires to adapt new energy sources and energy efficient stoves, willingness to pay (WTP) for improved energy service based on current electric use status, and criteria to set electric tariffs using descriptive statistics and logistic regression model.

2. Research Methodology

2.1. Description of the Study Area

The study area, Woreda 12, is found in Yeka sub city and one of the expansion areas of Addis Ababa. It is located at about 9°3'2"N, 38°52'41"E, 2,450 meters above sea level and approximately 11 km from the city centre. It is found around the holy church of Kotebe Gabriel, and Kotebe Metropolitan University (Fig. 1).

In this Woreda, there are very large numbers of informal settlers specifically located in Kotebe Gebriel, Hibret Amba, Rediet, Happy Village, Mesalemia, Sara Park, Kara and Demamit sites. Based on the data compiled from the respondents, in this study area, 78% of informal settlers have access to roads and transportation, 80% access to education and health centres, 20% live around river banks and low laying areas, 47% live close to forest resources and 38% located in a rugged topography.

Like any other developing cities, the city of Addis Ababa is faced with multiple development challenges such as urban expansion in a sprawling manner resulting in an estimated 46% of unutilized or underutilized land, extremely high density (up to 30,000 people per square km) at the city centre while the national average is 108 people per square km, and around 30% of the population lives on 8% of the city's land with poor living conditions (Young *et al.,* 2018)**.**

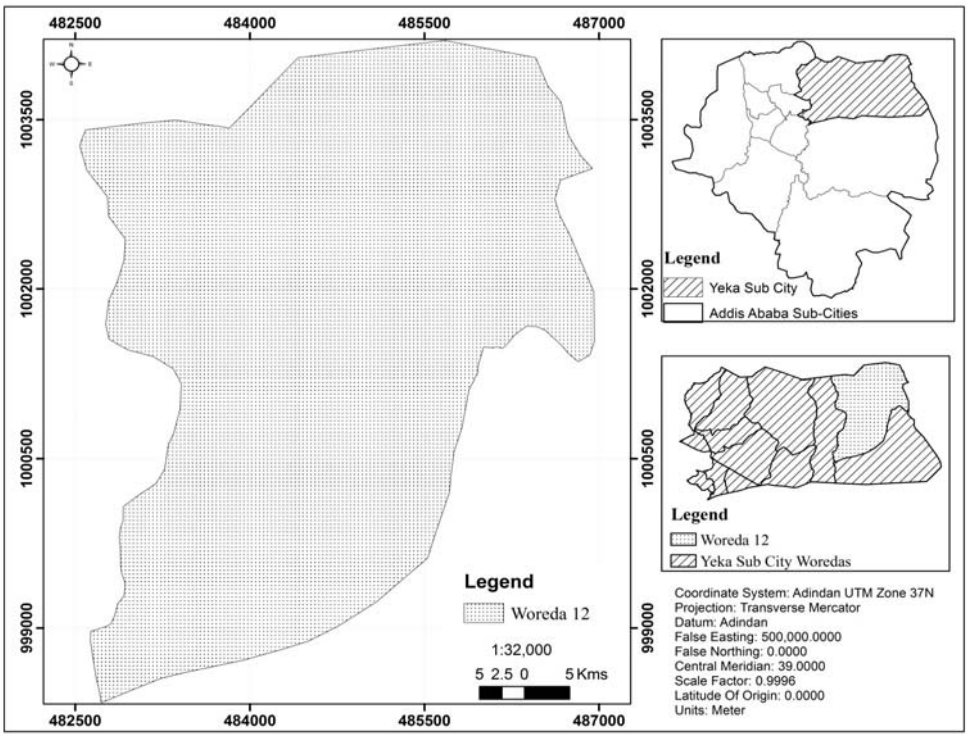

Fig.1. Location Map of the Study Area
Source: Modified from EthioGIS shape file

2.2. Sampling Method and Data Sources

Considering the existence of very large number of informal settlers, the sample design is down-scaled to Woreda, site and household level and samples were drawn in four stages.

1. Addis Ababa where Woreda 12 of Yeka sub-city was purposively selected due to the existence of large number of informal settlers.
2. Seven sites (2026 households) of electric-users[8] and three sites (6664 households) of non-users[9] of electricity were identified in Woreda 12 and this data served as a sample frame and both groups of households are informal settlers chosen for comparison purpose.
3. Two sites from electric-users (Kotebe Gebriel and Hibret Amba) and two from non-users of electricity (Kotebe Gebriel and Demamit) were selected using purposive sampling method to have a balanced number of households from each group and site.

4. Once the population of interest is specified, the representative sample size for study at 95% confidence interval that considers relative heterogeneity among the sites and relative homogeneity among households within the same site is determined using the formula as follows (Kothari, 2004):

$$n = \frac{Z^2 . N . p . q}{\sigma^2 (N - 1) + (Z^2 . p . q)}$$

Where, N_i & n_i = Population and sample sizes respectively

p = Maximum possible proportion (p = 0.5 and q = 1-p)

σ = Precision level or margin of error at 0.05

Z = Researcher's margin of error at 95% confidence level

Based on this formula 229 electric-users and 221 non-users of electricity that together constitute 450 sampling units were drawn randomly for the study by applying proportional sampling method for each site. This gave equal chance of inclusion to each household.

Primary data was obtained using a multi-tire questionnaire that helped to capture information on households' socioeconomic characteristics, main challenges to get electric service, coping strategies to the energy problem and households' criterion to pay for improved power supply. The questionnaire was administered on 450 randomly drawn households found in Kotebe Gebriel, Hibret Amba and Demamit and managed by the researcher and properly selected, well trained and closely supervised enumerators. The list of informal settlers was obtained from the registry book and computerized data base of Woreda 12 Administration and the data were collected during April and May 2020.

Field work during the pilot study and data gathering stages helped to observe the general housing condition, the landscapes, availability of infrastructures in the study area and closely monitor the activities of data collectors. To minimize distortions and personal biases associated with respondents' opinions and attitudes, the validity and reliability of the data gathered was verified carefully using statistical software (SPSS and Stata).

2.3. Method of Data Analysis

The outcome variables of this study are the challenges to get access to electricity and coping strategies established based on the data captured from informal settlers' in the study areas. Each household was asked to describe their challenges to use electric power and their coping strategies to the energy problem. Households were categorized into two: *current electric-users and non-users of electricity for domestic use.* Then, demographic variables influencing electric use, informal settlers' challenge to access electric power, and their coping strategies were analyzed using descriptive methods and binary logit models. The later in particular was applied to identify factors affecting households' willingness to pay (WTP) for improved electric supply, groups of households more influenced due to lack of access to electricity and criteria to be considered in setting electric tariffs.

3. Results and Discussion

3.1. Demographic Profiles of Informal Settlers

Knowledge of the demographic and socio-economic backgrounds of households in informal settlements is important to understand. The survey data in the study area showed that 63% of the household heads were males, 87% were from 30-60 years of age, 78% were married while the rest were either single or separated, and 54% have 3-4 families (Table 1). Education wise, 40% possessed first degree and above and 94% were either hired or self-employed[10]. From those who were hired, 91% were employed on permanent basis and the rest were working on contract, daily or hourly basis and 73% earn family income above 6,000 birr per month (this is the sum of money earned by all family members currently working).

Although all households considered in this study are informal settlers, 51% have access to electricity from the Ethiopian Electric Utility (EEU) legally and from their immediate neighbours that exposed them to pay higher electric bills than the official rate. The rest (49%) didn't use electricity except for illumination and charging mobile phones. Furthermore, regardless of their electric use status, 58% lived more than 6 years in the area, 70% lives in homes made from wood and cement and rated as "*good"*

by the households, only 31% owned more than 3 rooms, and 12% occupied a dwelling space more than 240 m^2.

Table 1. Households' Demographic and Socio-economic Data

Characteristics	Number of households	Percent
1. Sex: Male	284	63
Female	166	37
2. Age: Below 30	42	9
30-60	392	87
Above 60	16	4
3. Marital status: Single	78	18
Married	347	78
Separated	20	4
4. Family size: Up to 2 families	55	12
3-4 families	242	54
More than 4 families	153	34
5. Education level: Below grade 8	136	30
Grade 9-Diploma	134	30
Degree and above	179	40
6. Employment status: Hired	252	56
Self employed	170	38
Retired/unemployed	28	6
7. Employment type if hired		
Hourly and daily basis	4	1
Contract	19	8
Permanent	229	91
8. Family income: Up to 6,000 birr[11]	120	27
Above 6,000 birr	330	73
9. Electric use status: Electric-users	229	51
Non-users	221	49
10. Years lived in the area		
Up to 3 years	73	16
4-6 years	114	26
7-9 years	103	23
Above 9 years	155	35

11. Condition of home owned		
Poor (wood & mud)	106	24
Good (wood & cement)	313	70
Very good (steel & blockets)	28	6
12. Rooms owned: 1-2 rooms	168	38
3 rooms	139	31
More than 3 rooms	138	31
13. Land size owned: Up to 120m^2	79	18
120-240m^2	313	70
Above 240m^2	52	12

Source: Developed by the researchers based on 2020 survey data

3.2. Challenges to Access Electricity

Gaining access to electricity provides numerous benefits to households in informal settlements. The survey result revealed that it enables 85% of households to take 3-4 meals in a day, brings the socio-economic and business development to the residents, facilitates domestic activities, relives family members from the risk of smoke and generally improves the quality of life of the residents.

However, households were required to pay up to 10,000 birr for connection fee by the EEU and in the absence of credit facilities, non-users of electricity cannot afford to pay this charge. Following kerosene and LPG, electricity is the second most expensive energy source for households and 31% of the current electric-users contend electric bill is a financial burden to them. Electric-users unanimously agree that the power supply is not reliable (frequently interrupt and fluctuate). As a backup solution, most electric-users are found using firewood and charcoal for cooking and baking and rechargeable batteries and candles for lighting during electric blackouts and about 73% of households who already had access to electricity are forced to use the three-stone traditional stoves. On the other hand, more than 79% of households believe the price of biomass (fire wood and charcoal) is increasing over time and 58% of non-users of electricity are questioned its availability. Households' have very little knowledge on the availability of energy saving technologies for electricity and more than 85% of households attribute the concept of energy efficient technology to biomass use.

As presented in Table 2 below, 32% of informal settlers associated the reasons for lack of access to electricity to households' low income (about 27% earn below 6,000 birr or 133 USD per month) that varies on monthly basis. This forced them to consume low energy and the EEU to be unwilling to provide electric service in informal settlements. About 22% of households linked the denial to access electricity to their illegal land occupancy and scattered settlement. However, although households' lack of permanent address contributes the EEU loose trust on informal settlers, illegal land tenure by itself cannot be a criterion to provide electric service and households get electric supply. Similarly, even if residents' scattered settlement can make connection fees high and unaffordable, the study indicated that non-users of electricity are found mixed with the current electric-users and scattered settlement cannot be considered as reason to deter households' from access to electricity.

As explained by 21% of the households, ever growing demand for electric service, power supply shortages, and frequent electric interruption are key challenges to access electricity and these challenges mainly affected non-users of electricity and forced them to use biomass. The remaining 24% of households described that high and progressive electric tariff and EEUs' lack of responsiveness and mismanagement to provide the required service have also prohibited households from getting access to electricity. A similar study conducted by Blair *et al.* (2019), indicated that high electric tariffs deterred households from getting electric connection and exposed them to unaffordable electric bills. These problems left the energy needs of households in informal settlements remain unmet and deepened energy shortages.

However, the perception of electric users on the reasons for EEU reluctance to provide electric service in informal settlements is different from that of non-users of electricity. For example, households' low and irregular income is the reason opted by 28% of electric-users and 4% of non-users; illegal and scattered settlement by 7% of electric-users and 15% of non-users; high electric tariffs and bureaucratic red tapes by 23% of electric-users and 1% of non-users; etc. This implies that non-users' income, high electric tariff and long bureaucracy are not a basic constraint to get access to electricity.

Instead, their illegal and scattered settlement, supply shortage and their limited energy consumption might inhibit them from access to electricity.

Table 2. Reasons for Suppliers Lack of Interest to Provide Electric Service in Informal Settlements (%)

	Key Reasons	Electric-Users	Non-Users	Total
1.	Low and unstable income	28	4	32
2.	Illegal and scattered settlement	7	15	22
3.	Supply shortage and high energy demand	2	19	21
4.	High electric tariff	13	1	14
5.	Long bureaucracy	10	0	10

Source: Developed by the researchers based on 2020 survey data

On the other hand, if non-users of electricity are given the chance to get access to electricity, 61% either do not want to shift to new energy sources and use energy efficient technologies or change through time while 39% wants to shift automatically (Table 2). Among those who decided to shift to modern energy sources, use energy efficient stoves and consume more energy with lapse of time, 45% requires more than one year to fully adopt those technologies. The reason for total failure or slow transition to new energy sources and ICS is lack trust on the reliability of the new energy sources, limited knowledge on the new technologies, prior psychological influences and energy consumption habits and the desire to use the scarce money elsewhere (Table 3). Arlet *et al., (2019)* also confirmed that households facing frequent power outages and fluctuations lack trust on the reliability of the energy supply and discouraged to use this energy source. However, among households who decided to take instantaneous measures to shift to new energy sources and ICS, 58% are better educated (completed grade 9 and above) and 66% earn relatively higher family income (more than 6,000 birr per month).

Table 3. Non-Users Speed of Adopting Modern Energy Sources and Technologies and Key Reasons for Switching Failure

Speed of adopting modern sources and energy efficient stoves	Number of households	%
1. Never change	53	24
2. With lapse of time	82	37
3. Instantaneously	86	39
Reasons for switching failure	40	
1. Imperfect knowledge on the new technology	70	30
2. Lack of trust on the new sources		52
3. Past consumption habits and psychological influences	16	
4. To use the money elsewhere	8	126

Source: Developed by the researchers based on 2020 survey data

3.3. Households' Coping Strategies to the Challenges of Electricity

3.3.1. Applying energy stacking and energy ladder concepts

One of the most widely used coping strategies for households faced with lack of access to electricity, inadequate and fluctuating power supply, and unaffordable price is conducting a portfolio analysis of alternative energy sources with the concept of fuel stacking. Since informal settlers in the study area do not use animal dung, plant residues and biogas and solar energy is used only for illumination purpose, these sources are excluded from the options provided to respondents. The possibility of using three or more sources of energy is also deliberately left out on the premise that informal settlers with low and unstable income cannot afford to use more than two sources at the same time. Then, by considering biomass, kerosene, liquefied petroleum gas (LPG) and electric power and by mixing only two sources, households can have six options to choose from. As a result, 72% used electric power and LPG, 15% electric power and biomass, and 11% electric power and kerosene and all these combinations indicate electric power is inescapable and vital energy source for domestic use in informal settlements (Table 4). Similar to this, about 86% of households in Niger stack 2-5 low level energy sources while kerosene being the most easily mixed cooking energy with biomass (Ohadugha *et al.,* 2016).

Table 4. Households' Alternative Energy Sources

Alternative mixes	Freq.	Percent
1. Biomass and Kerosene/LPG	2	1
2. LPG and Kerosene	6	1
3. Electricity and Kerosene	51	11
4. Electricity and LPG	323	72
5. Electricity and Biomass	68	15

Source: Developed by the researchers based on 2020 survey data

Table 5 below provides households' economic, social, behavioural and environmental reasons for mixing two energy sources. Based on this data, 45% of households used two energy sources due to absence of one reliable energy source, 30% because each source is needed for different functions and the rest 25% use alternative energy sources for economic reasons such as saving labour, cost and time, due to lack of trust on the single energy source and other reasons. Of all these, the study shows low income households used two energy sources to cope the rising energy prices while high-income households take similar coping strategy due to their prior food consumption behaviours and as a cushion to unreliable electric supply.

Table 5. Households' Reasons for Using Alternative Energy Sources and their Electric-Use Status (%)

Major Reasons	Electric-Users	Non-Users	Total
1. To get secured and reliable energy source	23	22	45
2. Different uses/purposes of each source	14	16	30
3. Save family labour and time	12	6	18
4. Some sources are relatively affordable	2	4	6
5. Some energy sources have low cost appliances	-	1	1

Source: Developed the researchers based on 2020 survey data

Alternatively, energy transition can be prompted to reduce excessive reliance on traditional energy sources and switching to renewable energy sources, substituting one renewable energy source by another when there is frequent power interruption, fluctuation and outages, declining biomass and rising prices by utilizing power saving devices (Jalalimajidi *et al.,* 2018).

Households in the study area substituted one source of energy by another for different reasons (Table 6). For example, about 56% of households substituted one source (like biomass) by another (like electricity) due to lack of access and scarcity of energy sources. Such measures, however, require subsidies to electric power and minimizing or avoiding encouragements (if any) provided to households consuming poor energy sources such as fire wood, charcoal and kerosene. About 28% of households took substitution measures due to pushing factors such as high labour and time required to use lower level energy sources while the rest 16% shifted to energy sources due to high cost of energy which is not affordable to the poor, the need to get clean and healthy energy sources and a combination of reasons. However, the table below shows, the scarcity of energy sources and the reliability of electric supply are given much weight by electric-users. This indicates that power shortage and lack of reliable electric supply threatens not only non-users of electricity but it strikes much the current electric-users.

Table 6. Reasons for Substituting Existing Energy Sources by Households (%)

Major Reason	Electric-Users	Non-Users	Total
1. Scarce and not reliable source	31	25	56
2. Require more labour and time to use	13	15	28
3. Unaffordable/expensive energy source	4	4	8
4. Not safe and unclean source	3	4	7
5. A mix of two or more reasons	0	1	1

Source: Developed by the researchers based on 2020 survey data

3.3.2. Changing households' food consumption behaviours (FCB)

According to Hernández (2016), FCB are strategies used to cope, improvise and counteract the impacts of energy insecurity on environmental and economic benefits and reducing health, safety and residential stability risks. Fig. 2 presents households coping strategies to the electric problem in relation with their FCBs. Based on this data and assuming binary outcomes for each question raised to households, 58% of households consume foods cooked easily and stay longer periods once cooked, 46% reduce the number and adequacy of meals consumed per day, 40% minimize the variety of food

staffs consumed /nutrition level/, 37% reduce the frequency of cooking food per day or week and use food preserving methods, and 24% consume food staffs that are not fresh and lack the required level of taste and flavour.

However, except households consuming foods that can be easily cooked and stay longer, in all other FCBs, the proportion of non-users of electricity are greater than electric-users. This implies the need to change the FCBs of households accompanied by conducting awareness creation campaigns and reliable electric supply.

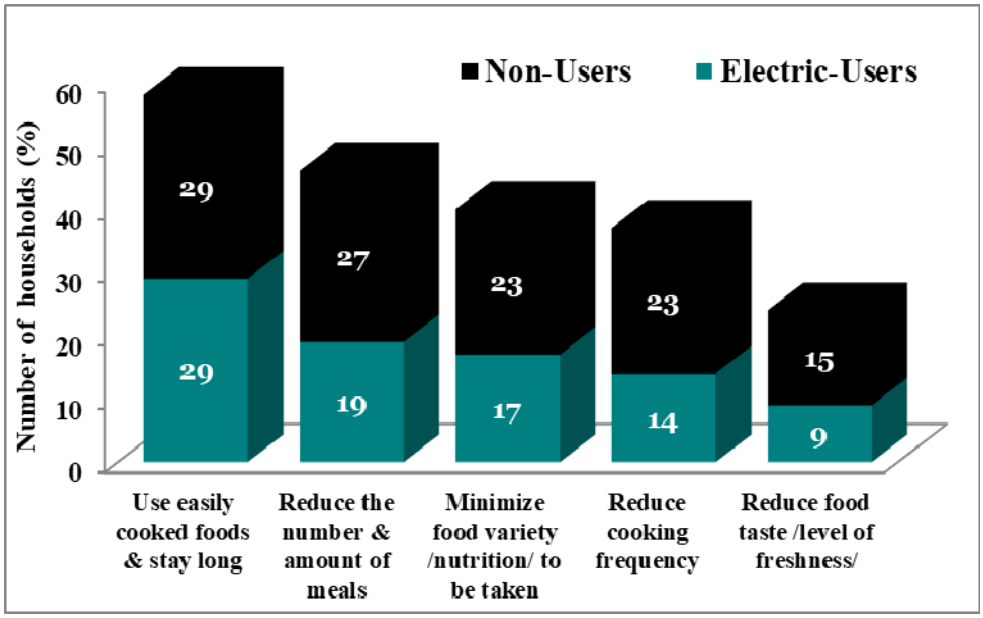

Fig. 2. Strategies to Change Households Food Consumption Behaviours based on Electric-Use Status

Source: Developed by the researchers based on 2020 survey data

3.3.3. Households' energy conservation strategies (ECS)

Households in informal settlements save energy using energy efficient cooking stoves, turn off devices including light bulbs when not in use with the aim of avoiding wasted energy, reduce peak time electric use, and use technologies such as power saving light bulbs and compact florescent lights to lower electric bills and reduce environmental damages, lower households'

spending, reduce indoor air pollution and change households' energy consumption behaviours that mainly depend on biomass.

Based on Fig. 3 below, since electric-users do not have access to reliable power and required to pay high and progressive electric tariffs, the number of electric-users are greater than non-users of electricity. For example, 50% of electric-users and 15% of non-users of electricity want to switch off everything when not using electricity and 46% of electric-users and 15% of non-users will reduce or do not want to use electric power during peak hours. However, the application of ECS requires huge investments, lowering thermostat settings and better maintenance of electric facilities and electric costs can be minimized by using lights, heating equipment and other appliances sparingly and reducing heat loss (Sovacool, 2014; Hernández, 2016).

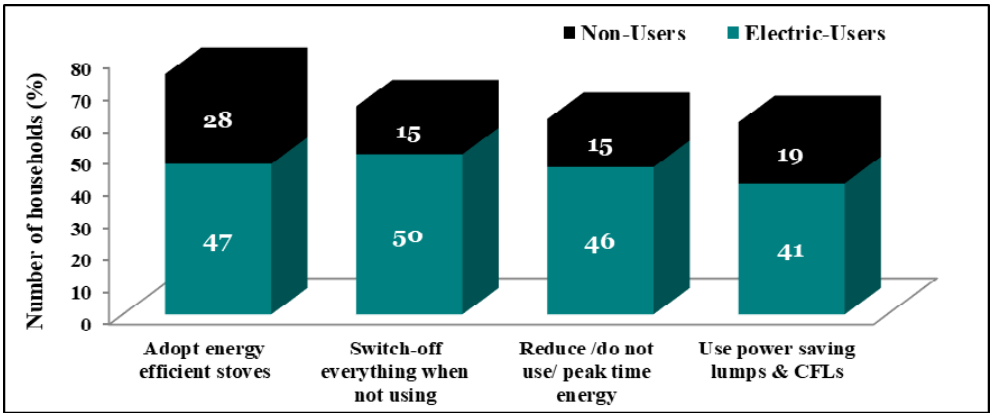

Fig. 3. Households' Energy Conservation Strategies based on Electric-Use Status
Source: Developed by the researchers based on 2020 survey data

3.3.3. Households' Coping Strategies (HCS)

These strategies are prompted by lack of alternative energy sources, require the support of others, short-term solutions, reactive in solving the problem and degrade households' resource base. Because of these, households in informal settlements responded to the challenges of electricity (inaccessible, inadequate, unaffordable and unreliable electric supply) in various ways. Based on the data on Table 7 below, 33% of households used cheap energy sources such as fire wood and charcoal, 24% energy efficient technologies

such as Mirt, Lakech and improved electric stoves, 22% existing low cost appliances, 11% reduced their basic expenses like food and used personal asset for energy and used it to for energy, 7% reduced or cut their energy consumption at all and the remaining others required the assistance of others and shifted family labor to do cooking and baking activities together with other domestic jobs. These coping strategies are widely applied by non-users of electricity except the inability to use low cost cooking devices and failure to reduce their overall energy consumption. This might be because of informal settlers' low level of income and electric-users' prior energy consumption behaviours that forced them to use traditional cooking appliances. A study conducted by Dlamini, (2015) indicated that low income households resorted to use traditional energy sources and suppress their demand through foregoing cooked meals and irregular bathing.

Table 7. Households' Coping Strategies to the Challenges of Electric Access based on Electric-Use Status (%)

Households' Coping Strategies	Electric Users	Non-Users	Total
Shift to cheaper energy sources	16	17	33
Use energy efficient expensive technologies	12	12	24
Use energy sources requiring low cost appliances	14	8	22
Reduce other expenses and use assets for energy	5	6	11
Reduce the overall energy consumption level	4	3	7
Require subsidies and credit for connection fees	-	2	2
Shift some family members to cook food	-	1	1

Source: Developed by own based on 2020 survey data

As a supplement to HCS strategy, households proposed alternative electric pricing strategies. To this end, 29% of electric-users preferred constant rate for any level of electric use, 28% decreasing electric tariff with increasing consumption, 27% progressive tariff structure /volume pricing/, and the rest 16% chose income or wealth-based electric pricing system accompanied by using prepaid cards. However, in an area where there is energy shortage, both flat metering and decreasing tariffs might not be good billing systems. Similarly, when there are large numbers of low income and squatter settlements, both income-based and progressive billing systems may inhibit households from access to electricity.

On top of these and deal with the high cost of connection fees required, the study indicated that 73% of non-users of electricity are willing to share electric meters with their immediate neighbours and 93% are willing to accept temporary and less power consuming primary electric functions (such as illumination, charging batteries and mobile phones, listening radios and watching televisions) at unsubsidized price. However, these measures do not typically lead to improvements in households' income, education and health and subsidizing connection charges based on the function of electricity, billing periods and use of energy-efficient lights are critically important to households (Barnes *et al*. 2016).

3.3.4. Policy Options

In addition to the above strategies, households suggested various policy options to solve the electric challenges of indigent people in informal settlements. These options include the following (Table 8).

1. Simply legalizing all informal settlers further exacerbates illegal land grabbing. Instead, allotting land to urban dwellers and electric meters based on the number of years households lived in the area and suitability of the land owned by them to the urban plan could increase access to electricity as confirmed by 97.33% of households. However, the data in the table 8 below shows this measure still favours more the current electric users than non-users implying the existence of some other criteria to provide access to households in informal settlements.

2. Since the Ethiopian Electric Utility (EEU) is the only electric supplier in Ethiopia, 94.65% of households in the study area explained that there is lack of adequate and reliable power supply, unaffordable price, and poor customer service. However, only 51% of households believe that involving a broad range of private electric suppliers improves the electric service and lower existing electric tariff, 21% believe this action does not change the overall electric service and 28% expect it worsens the electric problem in informal settlements. However, this policy favours more electric-users than non-users.

3. As suggested by 96.44% of households, providing solar panels freely or at low cost could help to reach indigent households in the outreach areas. In addition to subsidizing solar energy, setting affordable and flexible electric pricing systems, and removing subsidies on imported fuels could also improve the electric use status of informal settlers. Such measures are similar to Free Basic Electricity (FBE) program implemented in South Africa with the objective of mitigating energy poverty and facilitating households cope with escalating energy costs (Dlamini, 2015). However, FBE is costly and failed when large family sizes energy consumption goes beyond the threshold of 450kWh/month and households consuming subsidized energy sources may not take appropriate energy saving measures (Rouhier, 2010; Lloyd, 2014; Dlamini, 2015; Figueroa, 2016).

4. Technical measures such as lowering thermostat settings, servicing and repairing cooking appliances, recharging batteries and storing electric power when there is adequate power supply (as contended by 91.31% of households) could contribute to efficiently use scarce resources and help to deal with households' challenges to electric access. To this end Ampower (2019) indicated that every heating and cooling device in the home can be on and off based on pre-set schedule and appliance chargers can be timed to control how long devices have to be charged for. In this study, the data shows that taking technical measures benefits both groups of households fairly.

5. Marketing and financial measures such as effectively managing electric demand through discouraging peak time electric use by load shifting (providing adequate power at one time and less at another), setting high electric prices to push households use improved cooking stoves (ICS), managing demand for individual households through load limiting, and providing credit facilities for households using energy efficient cooking stoves could improve households electric use. These measures are very complex and their effectiveness, however, must be studied under highly controlled conditions. For example, a study conducted by Laicane and *et al.* (2015) revealed that transferring the load of a washing machine and

dishwasher to off-peak hours can reduce load by 24% and 13.5% respectively.

Although the policy options identified so far helps to deal with the challenges of all households, it specifically improves the electric supply of the current electric-users in informal settlements. Further applying a policy measure randomly may bring undesirable results or executing all policy options at the same time may contradict each other. It is, therefore, necessary to evaluate the interactive effect of alternative policy options on households' electric use status and their willingness to involve in cost sharing programs designed to improve power supply, which is the focus of the next section.

Table 8: Households' Perspectives on Policy Options to Access Electricity

	Electric-users			Non-users		
Policy options	**AG**	**ID**	**DG**	**AG**	**ID**	**DG**
Legalize land and provide electric	225	3	0	212	5	4
meters	224	2	2	201	8	12
Involve private suppliers	221	4	3	212	6	3
Provide solar panels	215	1	13	201	8	12
Provide subsidies and tailored electric	212	6	10	198	16	7
tariffs	21	29	179	61	37	123
Lower thermostat settings and servicing	209	3	16	191	15	15
appliances	187	5	37	157	10	54
Urge households use energy efficient	158	14	55	127	31	63
devices						
Reduce peak electric demand						
Provide credit to energy efficient users						
Managing demand						

Note: AG=Agree; ID=Indifferent; and DG=Disagree

Source: Developed by the researchers based on 2020 survey data

3.4. Households coping strategies to the challenges of electricity: binary logistic model

Table 9 below presents some of the demographic factors influencing WTP for improved electric supply and their coping strategies to the challenges to use electricity in informal settlements. Based on this data, demographic factors such as sex, age, education level of the household head and family income have no effect on households' WTP for improved electric service.

But females who do not use electricity are smaller than males by 114.71% implying females have better access to electricity than their male counterparts. Factors such as family size and the number of years a household lived in the area with informal status have significant effect on households' WTP for improved electric service. Accordingly, holding all other factors in the model constant, as family size increases, households' who are not WTP for improved electric service decrease by 76% implying large families are more willing to participate in cost sharing programs designed to improve electric supply than small families. On the other hand, as the number of years' households lived in the area increases, non-users of electricity who are not WTP for improved electric service increase by 30.43% indicating those who lived longer periods in the area (more than 7 years) are less willing to involve in cost sharing programs designed to improve the electric supply than those who lived for shorter periods (below 7 years). This is mainly because many informal settlers (68.22%) who lived longer periods in the area have already access to electricity.

In terms of food consumption behaviours, reducing the number of meals taken per day and amount of food consumed at a time are significant factors affecting households' WTP for improved electric service. In effect, under citreous paribus assumption, compared to households willing to reduce the number of meals per day and amount of food consumed, those who are not willing to take this measure are less by 48.89%. That is, households who reduced the number of meals in a day and amount of food consumed due to lack of access and unreliable electric supply are more WTP for the improved electric service. Further, non-users of electricity who want to cook food frequently and add its taste and freshness are less by 107.50% and 110.54% respectively than electric-users. That is, electric-users cook food more frequently and the taste and freshness level are better than that of non-users of electricity.

Among ECS, adopting energy efficient stoves and using power saving lamps and CFLs significantly affect households' WTP for improved electric supply. For instance, relative to households using energy efficient stoves, those who do not use these stoves are greater by 74.30% implying that

households currently using energy efficient stoves are less willing to participate in cost-sharing programs designed to improve the electric supply than non-users. Similarly, compared to those using power saving lamps and CFLs, households who are not using these technologies are greater by 84.16% indicating that households' currently using power saving lamps and CFLs are less WTP for improved electric service than those who do not use. In terms of electric use status, non-users of electricity not using energy efficient stoves are greater than electric-users. This might be because non-users of electricity may not understand the power shortage especially during peak hours and the financial burden of inefficient energy use and leaving light bulbs on when not in use.

Among alternative policy options considered, only legalizing land titles, providing individual electric meters and technical measures have a significant influence on households' role in cost sharing programs and deal with their electric challenges (Table 8). In lieu of this, holding all other variables in the model constant, compared to households who strongly agree, those who simply agree on legalizing informal settlers' land titles and providing individual electric meters are greater by 59.60%. This means households who strongly agree on legalizing informal settlers and receive individual electric counters are more WTP for improved electric service than those who simply agree. Similarly, compared to those who strongly agree, households who disagree on technical measures (such as lowering thermostat settings, servicing and repairing appliances) are greater by 33.90%. This implies that households strongly agreeing on technical measures are more interested to share the investment cost of improving electric supply. On the other hand, since non-users of electricity entirely depend on biomass for baking and cooking, the number of households requiring reliable electric power is greater than electric-users.

Generally, because of the inaccessibility of electric supply and high connection fees required by the EEU, 63% of households are willing to involve in a cost-sharing program designed to improve the current electric supply (availability, reliability and timing of energy service). Among these households, 63% are willing to add less than 33%, 29% from 33-66% and

the rest 8% from 66-110% of the current electric bill. On the other hand, households who are not willing to share the cost of improving electric supply explained that the existing electric bill is unaffordable and set based on market principles (37.50%), getting electric service at subsidized price is their right and governments responsibility (35.71%) and others believe electricity is unreliable source and household need to have alternative source (23.81%).

Table 9. Factors Influencing Households Willingness to Pay for Improved Electric Service and their Electric-Use status: The Binary Logit Model

Willingness to Pay (WTP)			**Electric-Use Status**	
Number of obs	=	430	=	430
LR chi2(27)	=	87.32	=	418.70
Prob > chi2	=	0.0000	=	0.0000
Pseudo R2	=	0.1535	=	0.7024
	Coef.	**Std. Err.**	**Coef.**	**Std. Err.**
			Non-users	
1. Demographic Factors				
Sex: Females	0.1015	0.2482	-1.1471	0.5112**
Age	0.1506	0.1940	0.4717	0.3432
Marital status	-0.0572	0.2716	-0.8015	0.5028
Education	0.0495	0.1522	-0.3424	0.2770
Family income	-0.3245	0.3199	-0.5070	0.6323
Family size	-0.7600	0.2014*	0.0610	0.3514
Years lived in the area	0.3043	0.1453**	-1.1255	0.2569*
2. Food Consumption Behaviors				
Use foods easily cooked & stay long				
Reduce meals: No	0.3745	0.2548	-0.8231	0.5137
Minimize food variety	-0.4889	0.2665***	-0.0282	0.4992
Reduce the frequency of cooking: No	-0.1134	0.2586	0.2220	0.4918
Reduce the taste & level of freshness:	0.0435	0.2980	-1.0750	0.5434**
No	-0.2342	0.2817	-1.1054	0.4951**
3. Energy Conservation Strategies				
Adopt energy efficient stoves: No	0.7430	0.3082**	2.8989	0.6674*
Switch-off everything when not using:	-0.5252	0.3724	6.4787	1.2751*
No	-0.2880	0.3238	1.9028	0.5256*
Reduce /do not use/ energy at peak	0.8416	0.2904*	-0.0018	0.5105

time: No				
Use power saving lumps & CFLs: No				
4. Households' Adaptive Strategies[a]	0.0954	0.0759	0.5085	0.1545*
5. Policy Options				
Legalize land & provide electric meters				
Provide reliable electric power	0.5960	0.2140*	0.4164	0.4506
Subsidize & set tailored electric tariffs	-0.2934	0.2544	1.0681	0.5006**
Set high prices to urge HHs' save energy	-0.1689	0.1570	0.0992	0.2507
	-0.0164	0.1234	-0.4367	0.2419***
Provide credit to energy efficient users	-0.1136	0.1191	-0.3059	0.2189
Provide rooftop solar panels	-0.1057	0.2127	-0.2808	0.4547
Technical measures	0.3390	0.1695**	-0.4343	0.3375
Reduce peak demand & storing energy	-0.1627	0.1564	0.0966	0.2766
Load limiting	-0.0926	0.1094	-0.2441	0.2010
Involve private electric suppliers	0.1744	0.1910	0.6653	0.4179
-cons	-0.6081	1.5056	-1.5839	2.6389
Base outcome			Users	

*, ** and *** are statistically significant at p< 1%, p<5% and P<10% respectively.
'a' include shift to cheaper energy sources, use energy efficient technologies and energy sources requiring low cost appliances, reduce other expenses and use it for energy, and reduce the overall energy consumption.

Source: Developed by the authors based on 2020 survey data

Table 10 provides major criteria that prompt households' WTP for improved electric service. These include source from which energy is generated (such as biomass, kerosene, LPG, solar power, wind energy or hydroelectricity), the residence place of a household and settlement patterns (such as proximity to transmission line, electric pole and a transformer, scattered or condensed settlement), season in the year electric power is required (such as dry or cold season), hours in a day electric power is needed (such as day or night time), and households' ability to pay the bills required (income brackets or wealth levels).

Pursuant to these criteria, the result showed that households in informal settlements responded positively and significantly to electric tariffs varied based on energy source, households' residence place (far or close to electric

line), and seasonal variations in power supply (low tariff in summer and high in winter). That is, compared to households who are WTP for improved electric supply and respond positively for tariffs structures set, those who are not willing to respond to tariffs set based on sources of energy are more by 64.16%, the place where they live by 36.90% and seasonal variations in energy supply by 35.76%.

The criteria used to set electric tariffs also determine households' electric-use status. For example, the number of non-users of electricity responding to tariffs set by the type of energy source is less than that of electric-users whilst non-users responding to tariffs set based on season of the year and time electricity is consumed in a day are greater than the number of electric-users.

Since most households (about 77%) earn family income below 9,000 birr per month, wealth-based billing system does not influence their WTP for improved electric tariff. In fact, this could be feasible when there is adequate and reliable electric supply as confirmed by 73% of the current electric-users. However, adequate electric supply is not possible in situations where there is sole electric supplier and EEU applied progressive tariff structure (volume pricing) for its services while more than 57% of electric-users still contend either flat metering or decreasing rate and prefer to make advance payments using prepaid cards. Similarly, households are not willing to adjust their electric consumption levels if the tariff varies within a day (i.e., low in the evenings, high at day time and peak from late afternoon to mid night). This could be associated with the work culture where almost all Ethiopians carry their activities (including cooking and baking) at day time.

Table 10. Criteria's to Set Electric Tariffs, Households' Willingness to Pay for Improved Electric Service and Electric Use Status

Number of obs		= 449	= 449	
LR chi2(5)		= 21.02	= 40.34	
Prob > chi^2		= 0.0008	= 0.0000	
Pseudo R^2		= 0.0354	= 0.0648	
Criteria	**Coef.**	**Std. Err.**	**Coef.**	**Std. Err.**
Willingness to pay: No			**Electric use status: Non-users**	
Source of energy	0.6416	0.2194*	-0.7990	0.2265*
Location /residence place/	0.3690	0.2093***	-0.0374	0.2109
Season of the year	0.3576	0.2011***	0.8451	0.2025*
Time in a day /24 hours/	-0.0585	0.2118	0.6812	0.2105*
Income/wealth	0.0831	0.4039	0.0320	0.4053
_cons	-2.4468	0.7058	-1.1329	0.6869
Base outcome	**Yes**		**Electric-users**	

*, ** and *** and are statistically significant at p< 1%, p<5% and p<10% respectively

Source: Developed by own based on 2020 survey data

It is also necessary to investigate the relationship between households' energy consumption levels (measured by energy expenditure made to each source) and improvements in income per month. According to Fig. 4, compared to the previous month, if family income per month increases by 100%, 77% of firewood users, 75% of charcoal users and 82% of kerosene users either decrease their energy use by more than 25% or do not change at all while 84% of LPG users and 97% of electric-users are willing to increase their current energy expenditure by more than 25% for clean energy sources. In other words, as family income increases, most of households would like to shift to clean energy sources and their energy consumption increases significantly (even beyond 100% of their current LPG and electric expenditures). In line with, as the incomes of households increase in South Africa, the increasing share of income goes to cover escalating energy costs (Dlamini, 2015).

The increase in firewood use by 23% and charcoal by 25% might be associated with households prior FCB and lack of adequate and reliable electric supply in informal settlements.

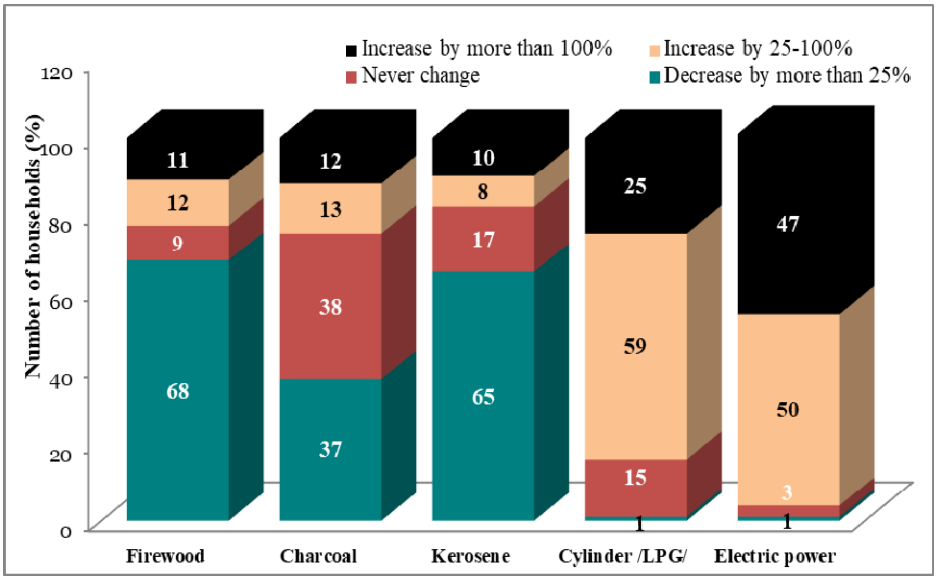

Fig. 4. Households' Energy Consumption Levels if their Income Doubles

Source: Constructed by the researchers based on 2020 survey data

4. Conclusions and Recommendations

Households in different locations of Addis Ababa do not have equal access to electricity. Informal settlers in particular lack access to electricity and those who already had access to electricity are faced with inadequate power supply, frequent interruption, fluctuation, and outages. Households' illegal and scattered settlement, low and unstable income, lack access to credit service has contributed much to the inability to pay unaffordable connection fees and electric tariffs required. Households in informal settlements also faced long bureaucracy and mistreated by the EEU to get the electric supply and 61% either do not want to shift to new energy sources and use energy efficient stoves or require relatively long period to adopt new technologies.

These challenges forced informal settlers in general and non-users of electricity in particular design numerous coping strategies. The data showed that non-users of electricity are resorting to get electricity from their

immediate neighbours at a higher rate than the official tariff set by EEU, about 73% have shown interest to share electric meters and pay connection charges in groups, and 93% are willing to accept temporary and low power consuming electric services. Depending on each households' socioeconomic condition, they also applied various energy mix and substitution strategies, changing FCBs, ECS and HCS.

The results of the binary logistic regression model indicated that households with large family sizes and lived in the area for short period of time (below 7 years) are more willing to participate in cost sharing programs designed to improve electric supply. In terms of FCBs, reducing the number of meals in a day and amount of food consumed helped to cope up the electric challenges of households and force them to involve in cost sharing programs designed to improve electric supply. In this regard, electric-users are found cooking frequently to get fresh food and get the desired taste than non-users of electricity. Similarly, households in informal settlements tried to conserve energy using energy efficient stove, power saving lamps and CFLs.

Among alternative policy options that can be considered at national level, formalizing the informal dwellers, providing individual electric meters to households, lowering thermostat settings, servicing and repairing cooking appliances positively influence households' willingness to involve in cost sharing programs designed to improve electric service.

To speed up households' transition to new energy sources and the use of improved technologies in informal settlements, energy suppliers shall focus on providing reliable electric supply, increase their awareness level on the benefits of new energy sources and power saving devices, and change their consumption habits. Involving a wide range of private suppliers in the energy sector by avoiding a sole source problem is also sought as the viable policy option to decision makers. Finally, to set a fair electric tariffs, billing systems shall consider the type of energy source, households' residence place (proximity to electric lines), and season of the year electricity is supplied, instead of setting tariff structures based on the income/wealth of the household and time in a day electric is consumed.

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Notes

1 Woreda is a local term used to describe the lowest administrative unit of Addis Ababa City Administration, Ethiopia

2 Electric-users are households using electric power for cooking and baking. They got this electric power from the Ethiopian Electricity Utility legally or from their neighbour by sharing electric cost.

3 Non-users of electricity refer to households who either do not use electric power at all or use it only for illumination purpose by buying from their neighbours at 50 Birr per lamp per month.

4 In informal settlements, self-employment includes both working in own business (often home-based) and for someone else on contract basis.

5 Birr is the currency of Ethiopia. Its official exchange rate of 1 USD during August 2021 is 45 Birr.

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3. Authors, reviewers and editors thus have the duty to ensure that articles submitted to EJDR contribute to scholarly dialogue on the economic, social, political and other related aspects of development in Ethiopia, and elsewhere. In addition to their scholarly quality, therefore, articles to be published in EJDR shall be selected on their potential to contribute to the growth of knowledge and academic debate.
4. Priority is given to articles that deal with development practices, policies, strategies and institutions in Ethiopia. However, articles concerned with other development-related issues of the country and of other developing countries are also welcome for publication so long as they have scholarly merit.
5. Every article submitted to EJDR shall be reviewed by at least two scholars of proven competence in the field. Where the two reviewers may give opposite recommendations, a third opinion is sought. In case, also the third reviewer remains indifferent, the Managing Editor has to take the issue to the attention of the Editor-in-Chief, who shall go through the reports of all the three reviewers, scan the article against those comments and then pass the final judicial decision on the fate of the article.
6. However, the Editor-in-Chief makes the final regarding the fate of each article.

7. Any article to be submitted to EJDR should be packaged in the required style and format and should be submitted to the Managing Editor at: ejdr.aau1974@gmail.com; ejdr1974.CoDS@aau.edu.et; negyon@yahoo.com
8. The responsibility for the views expressed in the articles that appear in EJDR is solely that of their authors, not of the editors or of the College of Development Studies, Addis Ababa University.
9. Multiple authorship articles receive priority over sole-authored ones. Also articles that are based on time-sensitive/perishable data are given priority.
10. EJDR does not accept articles and other contributions that have previously been published (be it in paper-based formats or Internet-based media, such as open-access journals) or are currently under review by other journals.
11. Articles submitted for publication in the EJDR must conform to the technical requirements set out in the "Guide to Authors" and the "EJDR Style and Format". It is not the editors' responsibility to correct style, incomplete references or factual fallacies.
12. In addition to the regular issues, CoDS may publish special issues of the EJDR that will be devoted to specific themes or programmes selected by the editors/the Editorial Board.
13. All articles submitted to the EJDR will be acknowledged, and status communicated to authors, but those not accepted for publication will not be returned to the authors.
14. Upon publication, authors of published articles will receive two copies of the particular issue and five off-prints of their articles.
15. The copyright on all the contributions published in EJDR is retained by the College of Development Studies, Addis Ababa University.
16. CoDS shall consider requests of authors to reprint their contributions elsewhere provided that the request is made in writing and the conditions stated in the copyright agreement are fulfilled.
17. Plagiarism, including self-plagiarism and reproducing once-own work, is a serious academic dishonesty. And so are double submission, double publishing. CoDS does not tolerate any such offence. Committing such an offence shall entail litigations leading to a series of severe consequences, including loss of all rights resulting from the plagiarized work, compensations for the harm caused to the original sources, compensations for the image damage caused to EJDR and the costs incurred in producing and disseminating

that particular issue of the Journal. Authors shall thus sign anti-plagiarism and anti- double submission declaration both at initial submission of articles and when they submit the final revised version of the article.

18. For non-commercial purposes, such as research and teaching, articles can be reproduced and used with due acknowledgement.
19. Authors are required to strictly adhere to the Editorial Policy of the Journal, “Notes to Authors and the EJDR Style Guide. Non-compliance can be a sufficient reason for rejection.

Ethiopian Journal of Development Research (EJDR)

Language and Style Guides

I. General

Contributors are encouraged to submit good scientific papers, which should:

- present an accurate account of the research investigation;
- be clearly written and easily understood;
- follow the particular style of the scientific discipline;
- be free of jargon and local slang;
- have appropriate, relevant and adequate illustrative material;
- not contain any plagiarized material (plagiarism is a serious offence and is a serious charge against an author).

Length: the manuscript should

- be double spaced on A4 paper size with 2.5cm margins on all sides (left, right, top and bottom).
- be 20–30 pages (for articles); 7-10 pages (for critical reviews and feature articles/commentaries); up to 3 pages (for book reviews and short communications).
- contain proportional and adequate presentation of the major sections of an article.
- contain well-balanced graphics (tables, graphs, illustrations) and textual elements.

Before submitting the manuscripts for publication in EJDR, authors are required to follow the following styles and formats, which are widely used in academic journals in development studies and the social sciences.

Structure: articles should follow the TAIMRAD(C/R) format, where the acronym stands for: 1) Title page; 2) Abstract; 3) Introduction; 4) Materials and Methods; 5) Results and Discussion (either harmonised together or presented as subsequent sections); and 6) Conclusions/Recommendations, followed by the References section.

II. Specific Details

1. Title Page

1.1. The Title Page shall contain the following shall details:

a. full title of the article, which should:

- contain not more than 250 words;
- avoid abbreviations, formulas and jargon;
- specify the study period (for articles based on longitudinal and historical data);

b. name(s) of the author(s);

c. the titles(s), academic position(s), address (institutions of their affiliation, postal address, telephone, e-mail etc., for correspondence) of the author(s) footnoted at the bottom of the page with the use of asterisks;

d. other relevant information such as name and address of a corresponding author, if the paper was presented at a meeting or is part of a series study, should be noted at the end of the manuscript.

1.2. Information on authorship and degree of authors' contribution. It is the responsibility of the authors to list their names according to the degree of contribution made by each of them, in a decreasing order of contribution. Normally, the following rules apply:

- ☞ Equal contribution is presumed when the names are written in alphabetical order; or
- ☞ The degree of contribution shall be determined by the order in which the names appear, unless indications are given by the authors to the contrary.

1.3. All correspondences will be made with the author whose name appears first (unless otherwise specified).

2. Abstract

The manuscript should have an abstract:

- not exceeding 250 words;
- that briefly introduces the problem, research gaps and the study area;
- that outlines the methodology, mainly the study design, approaches, sampling strategies, materials used and methods of data collection and analysis;
- containing the key findings of the study, their implications and conclusions or key recommendations.

3. Introduction

In this section, the author(s) should:

- give background to the study problem and the rationales;
- present statements of the problem, set the contexts, the nature and extent of the problem studied;
- indicate the study area and objectives of the research;
- introduce the research questions or hypotheses;
- present adequate review of the literature (both conceptual —including theoretical and conceptual frameworks— and empirical) related to the research;
- do all these in no more than five pages.

4. Materials and Methods

In here, authors are required to present clear account of:

4.1. the philosophical underpinnings, study design, approaches, sampling strategies, and methods of data collection and analysis. In so doing,
   - ☞ standard methods need only be mentioned, or may be described by reference to the literature as long as it is readily available.
   - ☞ modifications of standard techniques should be described.
   - ☞ if the method is new, it should be described in detail.

4.2. design of the experiment, including the number of replications (if the article results from experimental or quasi-experimental research);

4.3. materials used, including:
   - ☞ chemicals, laboratory equipment with the necessary technical specifications; standard units of measurement;
   - ☞ any plants or animals involved, with exact descriptions of genus, species, strain, cultivar, line, etc.);

4.4. justifications as to why the materials and methods used were chosen over others.

5. Results and Discussion

Depending on the craft and choice of authors, as well as on what the subject matter warrants, results and discussion can be either intertwined together or presented under separate sections. In any case,

- ➢ present only results that add new insights to existing knowledge;
- ➢ only results based on data and information scientifically-drawn from sources, but free from authors' personal dispositions and biases.
- ➢ results should be simply and clearly stated;

- reduce large masses of data to means, along with the standard error or standard deviation;
- include only tables, figures and graphs that are necessary, clear and worthy reproducing;
- repeat in the text only the most important findings shown in tables and graphs;
- refer in the text each table and figure by its number;
- include negative data—what was not found— if they affect the interpretation of results;
- give only data that relate to the subject of the paper (in other terms, include concomitant/related findings only if they are important);
- provide adequate answers to all the research questions or pursue all the hypotheses/assumptions made at start of the study.

6. Interpretation of the Results

This section, which should preferably be embedded with the 'Discussion' section, should:

- not repeat what has already been said in the review of literature;
- show significance of the results;
- relate the results to the initially-stated objectives and research questions or hypotheses that were set out in the introduction;
- show how the results and their interpretations relate to (agree or disagree with) previous findings and their interpretations.

7. Conclusion and Implications/or Recommendation

This is the section where,

- the author(s) draw, based on the findings and discussions of their implications, logical conclusions about each research question or hypothesis;
- nothing (methods, observations or results) should come as a surprise (should not be mentioned for the first time);
- authors should avoid unnecessary detail or repetition from preceding sections;
- show implications for theory, policy, practice, and/or further research to follow up the results.

8. Citation and Referencing

8.1. All materials, referred to or quoted must be acknowledged properly. Plagiarism is a serious academic dishonesty, which is unethical and illegal.

8.2. EJDR uses the *author-date* system of citations in all of its publications. Thus, authors have to ensure that author-date citations in the text agree exactly with corresponding entries in the reference list and that all publication details are accurate.

8.3. Citation and referencing should be complete according to this Style Guide, which is adapted with modifications from the Chicago Manual of Style 16th Edition.

The author-date citation in a running text or at the end of a block quotation consists of the author's/editor's last name, and the year of publication. Examples:

- Author, year, page no.: (Johnson 1987: 22–25).
- Two sources, with one author having two works: (Sen 1999; Jenden 1978a&b).
- More than three authors/editors: (Kassoguè *et al.* 1996).
- Organisation, year, volume, page no.: (World Bank 1988, 2:47).

8.4. Direct quotations should be as short as possible and all details should be reproduced exactly (spelling, punctuation and paragraphing).

☞ Short quotes should be placed in quotation marks.

☞ Long quotations should appear indented and centered in the text without quotation marks.

8.5. References in the text should read as follows:

* Brown (1975: 63) has argued that the ...

OR

* One economist (Brown 1975: 63) has argued that...

Use "*et al.*" when citing work by more than two authors. Example: A new treaty (Goody *et al.* 1976) suggests...

The letters a, b, c, and so on should be used to distinguish citations of different works by the same author in the same year. Example: Brown (1985a, 1985c) insist that...

8.6. Essential additional notes should be indicated by consecutive superscript numbers in the text and collected on a separate page at the end of the text, titled *End Notes* and placed before the 'References'.

Numbered notes should be used to denote clarifications about the references used, to include points left out in the text, to add some items which readers may want to know. If the citations or references in the text are too long, or consist of more than three names, it may be advisable to put them in the ***Notes*** at the end.

8.7. All references cited in the text and other supporting material should be listed alphabetically by author in a section titled References. Ethiopian authors should be listed alphabetically by first name first. Shiferaw Bekele, for example, should be listed under S and not under B. The same holds for Chinese names. Write out Ethiopian names in full in the Reference list (i.e., first and second names) as they are given in the publications cited. Do not abbreviate, for instance, as Shiferaw B. In the text, references may use first names only, or full names. Avoid, as much as possible, using honorific titles, such as Ato, Wzro, Dr., etc., in citations or references.

The following are examples of presenting bibliographical details of different entries

☞ ***Articles in Journals***

Alemayegu Lirenso. 1988. Food Aid and Agricultural Production in Ethiopia. *Ethiopian Journal of Development Research,* 10 (1): 59–90. (The last parts of the Journal can also be given as *Ethiopian Journal of Development Research,* Vol. 10, No 1, pp. 59–90.)

Cowley, R. 1967. The Standardization of Amharic Spelling. *Journal of Ethiopian Studies,* V. 2: 1–8.

Note: The volume and issue numbers should be entered as they are given in the journals cited, i.e., if the numbers are in Roman or Arabic numerals, they should not be changed.

☞ ***Books***

Bahru Zewude. 1991. *A History of Modern Ethiopia, 1955–1974*. London: James Curry.

Clapham, C. 1988. *Transformation and Continuity in Revolutionary Ethiopia*. Cambridge: Cambridge University Press.

Donham, D. and Wendy James (Eds.). 1096. *The Southern Marches of Imperial Ethiopia*. Cambridge: Cambridge University Press.

Listing of several works by the same author should be by year of publication, the earlier work preceding the recent. example:

Levine, Donald. 1965. *Wax and Gold: Tradition and Innovation in Ethiopian Culture*. Chicago: University of Chicago Press.

_____. 1974. *Greater Ethiopia: The Evolution of Multiethnic Society*. Chicago: University of Chicago Press.

☞ ***Book chapters and other contributions in books***

Wood, A.P. 1982. Spontaneous Agricultural Resettlement in Ethiopia, 1950–1974. ***In***: J. Clarks and L. Konsinski (Eds.), *Redistribution of Population in Africa,* pp. 1150–82. London: Heinemann.

☞ ***Contributions in proceedings***

Taddesse Tamirat. 1984. Feudalism in Heaven and on Earth: Ideology and Political Structure in Mediaeval Ethiopia. ***In:*** *Proceedings of the Seventh International Conference of Ethiopian Studies, University of Lund 26-29 April 1982,* pp. 195–200, Edited by S. Rubenson. Addis Ababa: Institute of Ethiopian Studies.

☞ ***Conference papers***

Hyden, H. 1990. 'Ideology and the Social Sciences: The African Experience'. Paper presented at the OSSREA Social Science Conference, 8–10 May, Kampala, Uganda.

☞ ***Unpublished works***

Messing, S. 1957. 'The Highland-Plateau Amhara of Ethiopia'. Ph.D. dissertation, University of Pennsylvania.

Alula Abate, *et al.* [these should be listed]. 1986. Evaluation of the Impact of UNICEF-Assisted Water Supply Projects in Bale, Harerge, Shewa and Wello- Ethiopia. Programme Cycle 1980–1983. *Research Report No. 30*, Institute of Development Research, Addis Ababa University, Addis Ababa.

☞ ***Official publications***

Central Statistical Office. 1975. *Results of the National Sample Survey Second Round, Vol. V. Land Area and Utilization*. Addis Ababa: CSA.

World Bank. 1973. 'Agricultural Sector Survey, Vol. I, The General Report. Report no. PA-143a.' Washington: World Bank.

_____. 1989. *Sub-Saharan Africa: From Crisis to Sustainable Growth*. Washington: World Bank.

☞ ***Online sources***

Further to the details in the above categories, include the date of access and the URL of the site whereat the material was accessed.

9. Format

A4 paper size with 2.5cm margins shall be the standard page size.

9.1. Title

Titles should be set in title case, NOT in all caps and should not contain acronyms and abbreviations.

9.2. Endnotes

Authors are advised to use endnotes instead of footnotes.

Endnotes should be numbered consecutively throughout each chapter or article, and placed at the end of a work, in a section titled "Notes", after any appendix and before the reference list.

9.3. Acknowledgements

These should be placed at the end of the text next to the appendix but before the endnotes.

9.4. Headings

Major chapter headings must be in Title Case and centered on the page. Sub-headings must also be in Title Case but aligned with the left margins. A manuscript with subsections should be presented as follows:

1.	2.	3.
1.1	2.1	3.1
1.2	2.2	3.2

However, authors are advised to avoid using more than three levels of subheadings unless the complexity of the argument warrants it. Preceded by the decimal notations indicated above.

- 1st level titles should be set in Times New Roman 14pts, bold;
- 2nd level titles should be set in Times New Roman 12pts, bold;
- 3rd level titles should be set in Times New Roman 12pts, bold-italics, run-on with text.

9.5. Text

Text should be set in Times New Roman, 12pt font size, double-spaced.

Block quotes should be indented from both sides and set in 11pt font.

9.6. Tables and Figures

- Tables should be used only where the data requires at least 2 rows/columns by 3 rows/columns. Shorter details shall be presented in text form.
- All tables and figures should be consecutively numbered and referred at the right place in the text.
- Titles of tables and figures should short and not in form.
- Each column and row of a table should have a proper title.
- All footnotes to, and sources of tables and figures, should be placed below them.
- Captions to figures should be placed immediately below the figures, followed by source information and Notes (if any) on some variables in the tables/figures.
- Keys to the different components of figures or graphs shall be placed at upper right corner within the boundary of the figure.
- Tables and figures should be used to present details and thus they should not be duplicated in text form. Unnecessary and lengthy tables and figures should be avoided, or, if important, should be annexed.

9.7. Abbreviations

Avoid use of dots in all familiar abbreviations, such as CSA, EEC, FAO, UNESCO, USA. However, dots should be placed at the end of the followings: e.g., etc., *et al.*, and other similar entries.

9.8. Language

- English is the medium of the Journal. Use one form of spelling, preferably the UK English (English English), throughout the article. Do not mix or switch between the two forms.

- All authors must avoid gender-biased and racist language.
- Use of discriminatory, inflammatory, and unethical expressions (derogatory, inciting, defamatory, etc. language) is unacceptable.

10. Copyright

The copyright on articles that would be published in EJDR would be relinquished to and retained by CoDS, AAU.

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[i]Several concepts and definitions flourished to depict aspects/approaches of sustainable land management. For example, the review by EcoAgriculure Partners (Scherr *et al.,* 2013), identified 80 English terminologies that are used at least by English speakers, all of which try to convey messages of multiple benefits provided by landscapes, such as Integrated Landscape Management, wise use of land resources, integrated watershed management, integrated natural resources management, ecological agriculture, sustainable agricultural landscape, etc. They try to combine current use and conservation for sustained ecosystem services.

[ii]McCann (1995), explains that human action in highland Ethiopia has taken place since the second epoch of Ethiopia's prehistory (P35); he also quotes the result of archeological evidences from Yeha (North Ethiopia), suggesting that earliest dry farming was started from 700 B.C. to 400 B.C. (p40) and also mentioned that the first charcoal making on the highlands was started 2500 years BPC (p35).

[iii]Major watersheds have an area more than 10,000 ha and they constitute several micro (community) watersheds, some of which have areas as small as 500 ha.

[iv] In fact, official reports from regions and the national level aggregates cite larger figures than this. The cited figure is taken from major initiatives (MERET, SLMP, WLRC, from regional states watershed management programs and NGOs)

[v]This study was part of a larger study on landscape management entitled "Ethiopian Learning Landscapes and Actors Dialogue".

[6]*Idir* is traditional social insurance/mutual help institution particularly for facilitating funeral ceremonies.