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International Journal of Current Research
Vol. 7, Issue, 06, pp.17203-17206, June, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

DETERMINANTS OF URBAN HOUSEHOLD COOKING FUEL CHOICE IN GHANA

[1,2,*]Julius Cudjoe Ahiekpor, [2]Edward Antwi, [1,3]Edem Cudjoe Bensah and [1,3]Joseph X.F. Ribeiro

[1]Chemical Engineering Department, Kumasi Polytechnic, Box 854, Kumasi, Ghana
[2]Centre for Energy, Environment and Sustainable Development, Box 854, Kumasi, Ghana
[3]Technology Centre for Renewable Energy and Energy Efficiency, Kumasi Polytechnic, Ghana

ARTICLE INFO

Article History:
Received 21st March, 2015
Received in revised form
17th April, 2015
Accepted 31st May, 2015
Published online 30th June, 2015

Key words:

Household cooking fuel;
Alternative cooking fuel;
Efficient stoves,
Ghana.

ABSTRACT

The study is based on primary data collected from 507 randomly selected households in 52 towns in the Kumasi metropolis in Ghana in an attempt to investigate the factors that influence primary cooking fuels option in urban homes in Ghana and suggests alternative measures to improve the use of sustainable alternative fuels and cleaner cooking. Graphical and cross-tabulation methods are applied to data drawn from a survey conducted in the metropolis. Though woodfuel (charcoal and firewood) is found to dominate the household fuel portfolio with 43.2 %, the use of LPG in the metropolis is very high representing 40.4% which is above the national average of about 20 %. However, 89% of households that patronise liquefied petroleum gas (LPG) also use charcoal as back up fuel due to the frequent and erratic shortages of LPG in the metropolis. The study indicates that low income prevents households from adopting cleaner fuels and efficient cooking options which involve high upfront costs. Also, affordability, availability of fuel and cooking rate of fuel and stove plays significant role in the type of fuel chosen.

Citation: Julius Cudjoe Ahiekpor, Edward Antwi, Edem Cudjoe Bensah *et al*. 2015. "Determinants of urban household cooking fuel choice in ghana", *International Journal of Current Research*. 7. (6). 17203-17206.

INTRODUCTION

As Ghana's economy grows from lower to higher levels of the middle income status, the adoption of long-term planning for energy development is required. Biomass energy consumption in the form of woodfuel (firewood and charcoal) constitutes about 61 % of the share of fuels used in Ghana while electricity and oil products constitute 7 % and 32 % respectively. The sustainability of woodfuels supply and usage has become a major policy issue in recent years.

Even though biofuels such as biogas, bioethanol and bio-oil could reduce the dependency on firewood and charcoal as household fuels, they have not been adequately developed to play a major role in Ghana's energy mix. In order to reduce the volumes of woodfuel usage and hence save the rate of forest degradation, there is the need to promote the development and utilization of alternative household fuels such as biogas, gel-ethanol, liquefied petroleum gas and efficient biomass stoves. This strategy has been outlined in the bioenergy policy of Ghana which is aimed at modernising and maximising the benefits of bioenergy on a sustainable basis (Antwi *et al.*, 2010). Also, several interventions in attempt to reduce the dominance of woodfuel for cooking seem to be having little impact.

Corresponding author: Julius Cudjoe Ahiekpor,
Chemical Engineering Department, Kumasi Polytechnic, Box 854, Kumasi, Ghana

Ghana household fuel characteristics

Fuel type used in Ghana comprises woodfuels, petroleum products in the form of Liquefied Petroleum Gas and kerosene and Electricity as shown in Figure 1. Fuel from biomass continues to play a crucial role in Ghana's total primary energy demand and supply. Over 70 % of households depend on woodfuels in the form of charcoal and fuelwood for cooking and heating water (GSS, 2013) which is putting a lot of pressure on the forest cover. It is reported that the forest has depleted to about 1 million hectares from 8 million hectares (Katako and Vigoda, 2007). This is partly attributed to indiscriminate felling of trees for wood fuel production. Also, wood fuel use is a major health problem in developing countries. It is estimated that about 6,500 deaths are linked to infections from pollutants released by burning wood fuels yearly (Ahiekpor *et al.,* 2014). Ghana government being conscious of the health and environmental implications of over dependence on fuelwood sorts to diversify cooking fuel source by introducing a more environmentally and health friendly cooking fuel onto the market. The introduction of liquefied

petroleum gas (LPG) unto the market was a major policy intervention by the Government of Ghana. Under the LPG Promotion Project, combined cylinder and stove were sold to consumers. This reduced the burden on consumers who until then had to buy the cylinder and stove separately (Amissah-Arthur and Amonoo, 2004). To make this successful, smaller cylinder sizes were introduced onto the market while the private sector was encouraged to setup service stations near demand centres (Abavana, 2004). This strategy enabled the consumption of LPG for cooking in households increase from 6 % in the 2000 to 18 % in 2010 (GSS, 2010).

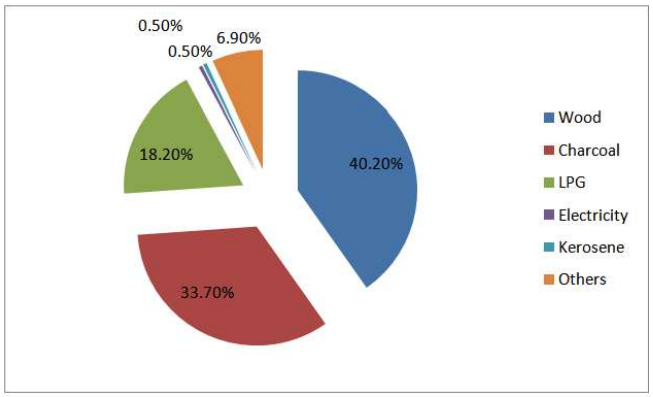

Figure 1. Household fuel type and usage

Biogas is also an alternative cleaner fuel that has been promoted in Ghana but yet to receive wide patronage. It is a proven technology that can be harnessed to provide a sustainable energy source for households and institutions in Ghana (Arthur *et al*., 2011; Bensah *et al*., 2010). However, it's development had suffered from a number of challenges: poor awareness programmes, low image of biogas as a modern source of energy, low involvement of government and absence of a national programme, high cost of biogas plants (from USD 235 to 446 per cubic meter), lack of proper maintenance services of plants, and inadequate follow-up services (Bensah, 2010; Bensah *et al*., 2011). Moreover, it appears the use of biogas (faecal gas) for cooking and digested effluent (faecal fertilizer) does not appeal to many people especially Muslims in cattle rearing communities in northern Ghana.

Also, ethanol use as household cooking fuel is yet to be adopted in Ghana on a large scale, although, some hotels and some other institutions use imported gel methanol for warming food. Ghana has the potential to use ethanol as a cooking fuel since the production of ethanol from agricultural resources has been practiced for many years. Lately, ethanol for use as household cooking fuel has been advocated by some organizations including the Centre for Energy, Environment, and Sustainable Development (CEESD); Kumasi Polytechnic and Global Resolve of Arizona State University (ASU). Despite, the efforts of government and other organization including the Ghana Alliance for Clean Cooking, to reduce dominance of woodfuels for cooking through several policy interventions, promotions and incentives, woodfuels seem to be the preferred choice in many homes. This work therefore seeks to identify the factors that motivate an urban household to adopt a particular type of fuel in Ghana.

MATERIALS AND METHODS

This case study is motivated by the limited research in Ghana focusing on understanding the drivers of cooking fuel choices. In an attempt to address this, a research study was conducted in the Kumasi Metropolis of Ghana. Households in all 52 towns within the metropolis were visited. The purpose of the study was explained to each household and the appropriate person(s), preferably the person responsible for cooking expenditure, in the household completed the questionnaire. The survey adopted quantitative and qualitative research methods involving the use of self-administered structured questionnaires. The selection of the households was done using stratified and simple random sampling techniques. A total of 507 questionnaires were completed and the data were analyzed in SPSS statistics version 17.0.

RESULTS AND DISCUSSION

A number of observations were made from the study. First, charcoal and liquefied petroleum gas (LPG) are the primary sources of cooking fuels in Kumasi accounting for 80.4 % of the responses with LPG being the preferred choice Figure 2. Woodfuels (charcoal and firewood) contributed 43.2% to total household energy use, followed by LPG, which contributed 40.4 % with electricity and keresone contributing 14.1 % and 2.3 % respectively. The domestic use of firewood in the metropolis is however very minimal accounting for 3.2 % of the respondents.

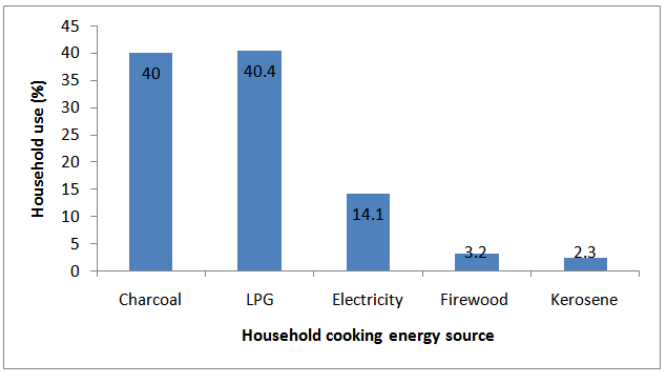

Figure 2. Primary household energy use ratios in Kumasi metropolis

Secondly, the use of cooking fuel is dependent largely on it availability or cost. Respondents' preferences for cooking fuel was influenced by four main factors, namely, availability, cost, cleanliness in terms of usage, and time of cooking. This is shown in
Figure 3.

Households that use fuel because it is either less expensive or easily available use more charcoal than any other fuel. This is obvious since charcoal is perceived to be cheaper and could be bought in small packs with less initial investment. Moreover, charcoal is easily available unlike LPG which is often in short supply and characterized by long queues for days before one could buy it from the gas stations. The mean expenditure of a household per month on fuel was however, higher for charcoal than LPG at GH₵ 12.6 and GH₵ 11.5 respectively.

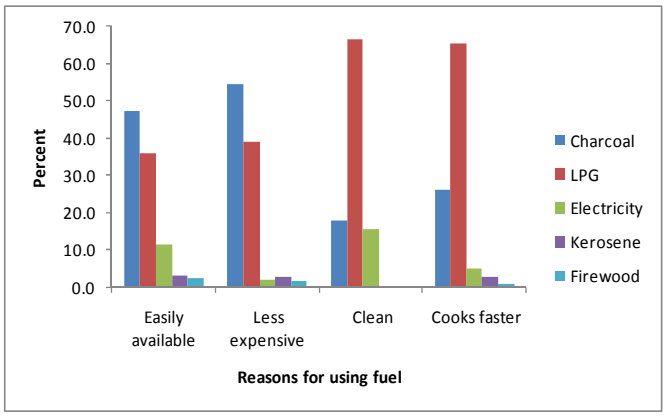

Figure 3. Reasons defining the choice for household cooking fuel

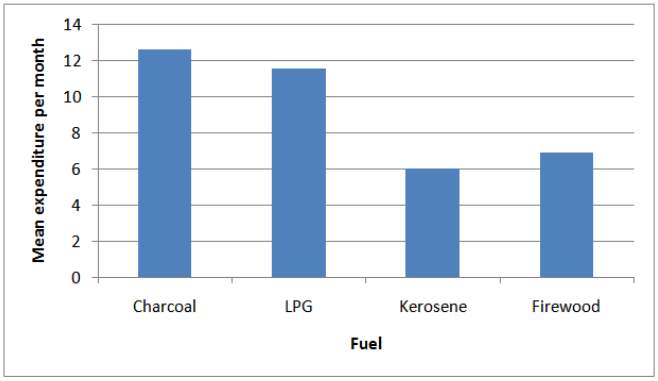

Figure 4. Mean expenditure of household on fuel per month

It is important to note, however that, for households that use fuel because it is cleaner or cooks faster patronize more LPG as can be seen in
Figure 3, suggesting that there is the potential for households to switch to clean alternative fuels if it were easily available and less expensive. The usage of LPG and electricity is notably increasing as income increases for a household. Figure 6 shows that the usage of firewood and charcoal declines with income growth, yet charcoal and LPG remain the main cooking energy source. Worthy of mentioning is the fact that about 89% of LPG users also use charcoal as spare fuel because they are unable to determine the quantity of LPG in the storage vessel and may not readily get LPG to buy if it runs out while cooking due to the frequent shortages of LPG in the metropolis.

The income for the households are categorized as very poor, poor, middle, rich and richest for households earning between below 499, 500 - 999, 1000 - 1999, 2000 -2999 and above 3000 Ghana cedis respectively each month. Household income as used here is the income of the person responsible for cooking or providing food for the household and not combined income. Figure 5 suggests that, charcoal is relatively prevalent among the highest income categories. Similar observation is found in other literature, and several reasons are speculated (Bardann *et al.*, 2002; Sulaman, 2011). For example, Bardann *et al.* (2002) found that the absence of the supply of cleaner fuel is a crucial determinant of adoption of solid fuels in Nepal. In addition, woodfuels may be encouraged due to the taste or texture it gives to food, or due to preference to use certain traditional cooking technique (Heltberg 2005), a phenomenon known as fuel stacking.

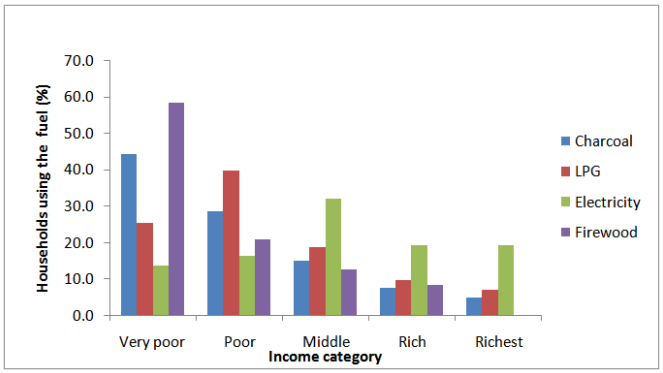

Figure 5. Relationship between income and fuel use

Also, the adoption rates of the major fuels: LPG, charcoal and electricity against household size are shown in Figure 6. Although the household size is not directly linked to fuel choice, it appears that the use of firewood increases as the household becomes larger users while small household sizes prefer LPG and electricity.

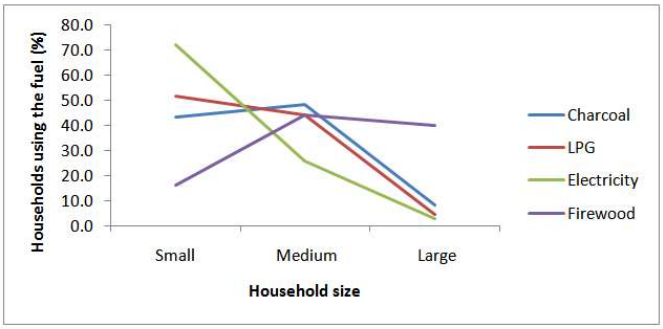

Figure 6. Usage of household cooking fuel against household size

From Figure 5 and Figure 6, it could be deduced that low income category tends to adopt more firewood compared to the richest. The high income earners tend to use LPG and electricity and belong to a relatively small household size. These observations imply that household size matters for fuel choice in Kumasi. However, whether the household size raises the adoption probabilities of all fuels or of particular fuel needs formal testing.

Conclusion

Woodfuels continue to dominate the energy mix of Ghana. The sustainability of woodfuels production has become a major policy issue since the use of firewood and charcoal as household fuels have contributed partly to the reduction of Ghana's forest cover. In finding alternatives to woodfuels as household fuel, several alternatives such as LPG, gel ethanol, and biogas should be promoted. LPG promotion and usage in rural and urban communities in Ghana has not gone smoothly due to challenges with the production and distribution systems, general weak infrastructure and an increase in the use of the fuel in vehicles. Gel ethanol and biogas systems have not been

fully exploited and developed. The results from the study show that charcoal and LPG are the primary source of cooking fuel in Kumasi accounting for 80.4 % of the responses with LPG being the preferred choice. Woodfuel contributed 43.2% to total household energy use, followed by LPG, which contributed 40.4 % with electricity and kerosene contributing 14.1 % and 2.3 % respectively. Though 40.4% of the population uses LPG, which is above the national average of 18.2 %, about 89% of LPG users also use charcoal as spare fuel due to the frequent shortages of LPG in the metropolis. The results suggest that, low income prevents households from adopting cleaner fuels, which involve high upfront costs. Income, availability of fuel and cooking rate of fuel are found to induce the adoption of a fuel. Further, households that use fuel because it is either less expensive or easily available use more charcoal than any other fuel. This is obvious since charcoal is perceived to be cheaper and could be bought in small packs with less initial investment. Moreover, charcoal is easily available unlike LPG which is often in short supply and characterized by long queues for days before one could buy it from the gas stations. The results also indicate that, the mean household size per income considerably varies for a given fuel option. The low income category belongs to large households and tends to adopt more firewood compared to the richest. The high income earners tend to use LPG and electricity and usually have relatively small household size. These observations imply that household size influences the choice of fuel in Kumasi. Moreover, there is the potential for households to switch to clean alternative fuels if it were easily available and less expensive.

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