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Nigerian households' cooking energy use, determinants of choice, and some implications for human health and environmental sustainability

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ABSTRACT

The aim of this study was to investigate the types of cooking fuels and factors that influence their choice by households in Nigeria. Cross national data used were extracted from the 2013 Nigeria Demographic and Health Survey (NDHS) on households' cooking energy and was subjected to descriptive and inferential statistics. The results indicated that 55% of sampled households have access to electricity, while about two-third (66.3%) of households depend on biomass as fuel for cooking. The Chi-square analysis revealed that a significant statistical relationship existed between geo-political regions, place of residence, access to electricity, educational level, and wealth index and type of cooking used. Results also showed significant statistical differences between rural and urban households' type of cooking fuel while analysis of variance found significant differences in the type of cooking fuel according to regions, educational level, and wealth index. Multiple regression results demonstrated that socio-economic factors such as household size, geographical region, place of residence, educational level and wealth index have a significant positive influence on the type of cooking fuel used by households in Nigeria. However, access to electricity showed no significant association with the household type of cooking fuel. These results have important implications for human health and environmental sustainability, and therefore it was recommended that government needs to intensify educational efforts towards enlightening people about the need for the sustainable utilization of energy resources.

1. Introduction

For decades, the issue of energy use and management has been a subject of global discourse not only because of its role in socio-economic and technology development but also in view of its negative impact on human health and the environment across countries and regions (Hall & Scrase, 1998; Fruergaard, Astrup, & Ekvall, 2009; Moldan, Janoušková, & Hák, 2012). This concern is more imperative in addressing some of the Millennium Development Goals MDGs), notably, goal 7 – which calls for ensuring environmental sustainability, especially for the poor and vulnerable people (World Energy Council (WEC), 2008). According to the International Energy Agency (IEA, 2014), more than 3 billion people worldwide use biomass in the form of fuelwood, animal dung, agricultural residues and charcoal to meet their cooking energy needs; of which 2.6 billion of this population were estimated to live in developing countries. Existing literature (Smith et al., 2007; World Bank, 2006; Adkins, Tyler, Wang, Siriri, & Modi, 2010) attests to the environmental and health effects of human dependence on traditional biomass. Women and children are reportedly exposed each day to pollution from indoor cooking smoke as they spend many hours near cooking fires. Such indoor exposures have been linked to acute respiratory illnesses, chronic obstructive lung diseases, low birth weights, lung cancer and eye problems, primarily, among women and children (World Health Organisation (WHO), 2007; 2014). Consequently, smoke from cooking fuels is estimated to account for nearly 2 million deaths, of which more than 99% occur in developing countries (WHO, 2007). According to the IEA (2014) Report, nearly 600,000 premature deaths occur in Africa from household use of solid biomass energy.

About 13% of the world's population lives in sub-Saharan Africa (IEA, 2014). However, the African continent is reported to account for only 4% of world energy consumption; the lowest per capita modern energy consumption in the world although it is richly endowed with various types of energy resources (solar, hydro, wind and geothermal). The continent also has 1.3 billion of world's

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people without access to electricity and one-quarter of the estimated 2.6 billion people in developing countries that depend on biomass for cooking and space heating (World Bank, 2012; IEA, 2014). More than 90% of the rural population relies on biomass, while well over half of all urban households also rely on fuelwood, charcoal or wood waste to meet their cooking fuel needs (WHO, 2006; WEC, 2008). This heavy reliance on traditional bioenergy is leading to increases in greenhouse gas emissions, low level of energy efficiency, deforestation, loss of biodiversity, health problems from indoor air pollution and reduction in capacity to mitigate climate change (Food and Agricultural Organisation (FAO), 2011; 2014).

Nigeria is sub-Saharan Africa's most populated country with an estimated population of 182 million people (United Nations, 2015) and it is estimated that 60% of them are not having access to electricity, while those with access often struggle with erratic, unstable power supply and continuous, arbitrary price increases by the power distribution companies (IEA, 2011; 2014). However, the country is richly endowed with abundant energy sources in the form of fossil fuels (oil, gas and coal), hydropower, uranium, biomass and other renewable energy sources - solar, wind, and geothermal power (IEA, 2011; 2014). Nigeria is the sixth largest producer of crude oil in the world and has the second largest crude oil reserves in Africa (United States Energy Information Administration (US EIA), 2015). The country's liquid natural gas (LNG) is estimated to be 187 trillion standard cubic meters, which is the largest in Africa and 9th largest in the world (IEA, 2011; 2014). Yet, Nigeria's current electricity generation is found to be less than 6000 MW (IEA, 2011; 2014). Moreover, over 80% of the country's population especially in the rural areas still rely on fuelwood for cooking and other domestic uses. Inevitably, the loss of forest resources such as trees and wildlife and accelerated deforestation and desertification as well as soil erosion, are some of the long term environmental problems associated with biomass consumption in Nigeria (Adelekan & Jerome, 2006). In fact, nearly 45,000 ha of woodland are lost annually due to illegal felling of trees and shrubs for domestic biomass and charcoal production. If these trends continue unabated, by the year 2020 all the forest resources would be lost (FAO, 2011; 2014).

2. Research objective and questions

A number of studies on the fuel type use and determinants of choice of fuel for cooking have been conducted in some developing countries such as China, Philippines, Pakistan, as well as India (Démurger & Fournier, 2010; Ekholm, Hrey, Pachauri & Riahi, 2010; Jan, Khan, & Hayat, 2012), and sub-Saharan Africa (Sudan, Malawi, Zimbabwe, Mozambique, Ghana and Nigeria) (Adkins, Oppelstrup, & Modi 2012; Mekonnen & Kohlin, 2008; Cuvias, Jirjis, & Lucas, 2010; Mwaura, Okoboi, & Ahaibe, 2014). However, a review of the available literature has shown that only a few surveys relating to Nigeria exist on household cooking fuel use. Moreover, in Nigeria, most of the studies conducted were in a few local government areas (Oyekale, 2012; Naibbi & Healey, 2013; Babalola & Opii, 2013). Thus, no previous studies have been conducted to provide a national level profile as well as an intra-national comparison in terms of types of cooking fuels and factors that influence their choice by households in Nigeria. Again, the only factors which were considered entailed income, sex and age of household heads as determinants of fuel choice. On the other hand, the examination of factors such as access to electricity, territorial aspects and type of residence may help in identifying and understanding areas within the country that are worthy of government intervention and assistance. It is against the foregoing background that this study was conceived to assess types of cooking fuel used and the determinants of the choice of cooking fuel amongst households at national level as well as their implications for environmental sustainability. To address this main goal, four research questions were formulated and they are specified as follows: (1) What is the pattern of access to electricity and fuel type used for cooking at households at national level? (2) Is there any significant statistical difference in household type of fuel used for cooking based on educational level, type of residence, number of household members, region and wealth? (3) Is there any significant statistical relationship between household socio-economic characteristics and types of fuel used for cooking? (4) Can socio-economic characteristics predict household types of fuel used for cooking?

3. Study area and research methodology

3.1. Study area

Nigeria lies roughly between latitudes 4° and 14° North and longitudes 3° and 15° East in West Africa. It is bordered by the elongated territory of Benin to the west, the semi-arid country of the Niger Republic to the north, the sub-equatorial Cameroon to the east and the Atlantic Ocean to the south. Her population is estimated at about 182 million with an average density of 200 people km^2 (United Nations, 2015). The total land area is nearly 923,773 km^2, which is about 14% of the land area in West Africa. The country is richly endowed with abundant natural resources, both renewable and non-renewable. Currently, Nigeria comprises 36 States and a Federal Capital Territory (FCT), grouped into six geopolitical zones: North Central, North East, North West, South East, South–South, and South-West (Fig. 1).

The country's population is predominantly rural. It is estimated that 70% of Nigerians live in rural areas and are directly or indirectly dependent on forest resources (Federal Ministry of Environment (FME, 2008). A major feature of Nigeria's coastal and marine environment is the Niger Delta, which covers an area of 70,000 km^2, and this makes it one of the largest wetlands in the world. The mangrove forests of Nigeria rank as the largest in Africa, and the third largest in the world.

3.2. Data analysis

The data for this study was extracted from the Nigerian Demographic and Health Survey (NDHS) conducted in 2013. This survey was nationally representative of 38495 households. Women's ages ranged from 15 to 49 whereas men's age was in the 15–59 brackets. With the aid of the SPSS 20 software, frequency, percentage, chi-square and logistic regression were used to address the research questions specified. A probability level of 0.05 was used for all tests of significance (National Population Commission (NPC) [Nigeria] and ICF International. (2014).

4. Results

From the data analysis, 55% of households have access to electricity, while 44% responded in the negative. The dominant type of fuel used for cooking is fuelwood, which is used by 66.3% of households. Kerosene is the country's second most preferred source of household energy with 23.6% of the respondents using it on a daily basis. Three percent (3%) of households used charcoal. Only 1.3% used natural gas while less than 1% of the respondents used each of the other sources of energy for cooking (electricity, LPG, biogas, agricultural residue and animal dung) (Table 1). The survey showed that 81% of households are using wood fuels (fuel wood and/or charcoal) as the main energy source for cooking.

Cross tabulations were conducted to show the relationship

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