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Fuelwood Utilization and Health Effects among Farming Households in Ekiti State, Nigeria

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ABSTRACT

Fuelwood has long served as a major energy source known and used for cooking in developing countries. The combustion of fuelwood emits smoke with particles that have adverse effects on the health of users. This study investigated the health effects of fuelwood utilization among farming households in Ekiti State, Nigeria. Primary data was obtained from 120 farming households with the aid of a pre-tested questionnaire and focus group discussion. A multistage sampling technique was employed in selecting respondents for the study. Data were analysed using descriptive statistics and a probit regression model. Results revealed that the majority (75.8%) of the respondents were female with a mean age of 42 years and mean household size of 9 persons, 42.5% had primary education and earned a mean monthly income of ₦26,380. The major health problems associated with fuelwood utilization in the study area were eye irritation (56.6%), sneezing (50.8%) and breathing difficulty (43.3%). Sex ($p<0.05$), marital status ($p<0.05$), household size ($p<0.01$), primary occupation ($p<0.01$) and income ($p<0.05$) were the factors determining the health effects of fuelwood utilization among the farming households in the study area. The study recommended that renewable energy sources such as kerosene and cooking gas should be made readily available to farm families at subsidized and affordable prices.

INTRODUCTION

Wood is considered mankind's very first source of energy. Today, it is still the most important single source of renewable energy providing about 6% of the global total primary energy supply (FAO, 2019). Wood fuel or fuelwood may be available as firewood, charcoal, chips, sheets, pellets and sawdust (Ojo et al. 2012). Fuelwood is a source of energy derived by burning wood materials like logs and twigs and is common among rural dwellers. It is a traditional source of energy, which has remained the major source of fuel among farming households (Kadafa et al. 2017). Globally, about 3 billion people depend on fuelwood to meet their domestic energy needs. Private households' cooking and heating with fuelwoods represent one-third of the global renewable energy consumption, making wood the most decentralised energy in the world (Jagger and Shively, 2014; FAO, 2019). Nearly 90% of the households in developing countries depend on fuelwood for cooking and/or heating (Scheid et al. 2019). Poor access to modern energy rates in less developed countries (LDCs) and Sub-Saharan (SSA) countries remain high at 91% and 83%, respectively.

In Nigeria, it is estimated that about 91% of the household energy needs are met by biomass (Babalola, 2010). The over-dependence on fuelwood for energy is chiefly because of its affordability and easy accessibility relative to alternatives, such as bottled gas, kerosene or electricity. Clean energy such as kerosene and gasoline are scarce in the rural areas and often sold at a price far above the official pump prices, the supply of these

alternatives is highly constrained and unreliable. This is especially true of electricity which is subject to frequent outages (Nnaji et al. 2012; Sa'ad and Bugaje, 2016).

The combustion of solid wood fuel indoors and outdoors emits smoke with particles that have adverse effects on the health of users. Several studies (Vivan et al. 2012; Odunuga and Akinbile, 2015; Kadafa et al. 2017; Piabuo and Puatwoe, 2020) have reported significant health effects of wood fuel combustion for cooking in rural areas. Fuelwood, especially, through open-fire three-stone stoves has implications for individuals' health, particularly, for women and children who spend hours beside the cooking fire and inhale smoke because they are primarily responsible for cooking (Sa'ad and Bugaje, 2016). About 1.3 million people, mostly women and children die prematurely every year because of exposure to indoor air pollution from biomass (Vivan et al. 2012). A child exposed to indoor air pollution is more likely to catch pneumonia, which is one of the world's leading killers of young children. In addition, indoor smoke has been linked to low birth weight, infant mortality, tuberculosis, cataracts and asthma (Sa'ad and Bugaje, 2016). Among women, there is a high association between fuelwood combustion and a high risk of chronic bronchitis and chronic obstructive pulmonary disease, especially asthma and cataract. Indoor combustion of fuelwood has been called the 'kitchen killer' because about 1.6 million deaths have been registered as a result, accounting for 2.7% of the global disease burden (WHO, 2007; Piabuo and Puatwoe, 2020). The most common forms of respiratory tract infections as a result of exposure to smoke due to cooking fuel are dry cough, breathing problems, neurologic problems, cardiopulmonary, cardiovascular diseases, asthma and lung cancer (Zidago et al. 2016; Mbanya and Sridhar, 2017; Mohapatra et al. 2018). Lower life expectancy has equally been reported by Badamassi et al. (2018). Other diseases such as asthma, stroke, and immune system impairment have equally been attributed to indoor and outdoor pollution as a result of fuelwood combustion (Tao et al. 2016). The poor in developing countries, therefore, pay much more in terms of health impacts, collection time, and stress compared to their counterparts in the developed world (Vivan et al. 2012). From the foregoing, this study investigates the health effects of fuelwood utilization among farming households in Lagos State with the following specific objectives: i) describe the socio-economic characteristics of farming households in the study area ii) identify the major health effects experienced as a result of fuelwood utilization iii) determine the health effects of fuelwood utilization among farming households in the study area.

METHODOLOGY

The study was conducted in Ekiti State, Nigeria. Ekiti State was created on the 1st of October, 1996. Its capital is Ado-Ekiti. It is located between latitude 7025' 8005'N and longitudes 4045' 5046E. The state is bounded in the north by Kwara State and Kogi State while Osun State occupies the west and Ondo State lies in the south and extends to the eastern part. The state is made up of 16 Local Government Areas (LGAs) with an estimated population of 3,270,800 (NPC-NBS, 2016) and a total landmass of 6,353 square kilometres. The two prominent climatic seasons in the area include the rainy season, lasting from April to October and the dry season within November and March. Temperature ranges between 21 °C and 28 °C with high humidity. The people of the state are predominantly farmers. Cocoa is the main cash crop while yam, cassava and grains like rice and maize are the major food crops produced in the state. Besides farming, the inhabitants of the state are artisans, traders, civil and public servants.

Sampling procedures

A multistage sampling technique was used to select respondents for the study. The first stage involved the purposive selection of two local government areas (Ekiti East and Ijero LGAs) due to the prevalence of farming activities in the LGAs. In the second stage, a simple random sampling technique was used to select five villages from each of the LGA making a total of 10 villages. The third stage involved the random selection of 12 farming households from each of the selected villages making a total of 120 farming households for the study.
The study was based on the primary data obtained from farming households in the study area using an interview schedule with the aid of a pre-tested questionnaire and supported by focus group discussion. Data were collected on socio-economic characteristics of the respondents, sources of fuelwood used for cooking and health issues experienced as a result of fuelwood utilization in the study area.

Analytical techniques

The following analytical tools were employed in this study.

Descriptive analysis

Descriptive statistics such as frequencies, percentages, means and standard deviation were adopted to describe information on the socio-economic characteristics of the farming households, sources of fuelwood utilized for

cooking and health problems experienced as a result of cooking with fuelwood in the study area.

Probit regression analysis

The model was used to determine the health effects of fuelwood utilization among farming households in the study area. The model is explicitly specified as:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + e_i \quad (1)$$

Where: Y is the dependent variable that takes 1 if the respondents experience any health issue as a result of fuelwood utilization and 0 otherwise. The explanatory variables are: X_1 = Age (years), X_2 = Sex (dummy), X_3 = Education (level), X_4 = Marital status (1 if married, 0 if otherwise), X_5 = Household size (No of people), X_6 = Primary occupation (1 if farming, 0 otherwise) X_7 = Income (₦), β = parameter to be estimated, e_i = error term. SPSS version 20 and Stata version 12 were used for data analysis.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents in the study area

Table 1 presents the results of the socio-economic characteristics of the respondents in the study area. The results reveal that the majority (75.8%) of the respondents were female while 24.2% were male. This is not unexpected as women are traditionally responsible for cooking in households and are therefore more likely to be exposed to health problems associated with fuelwood utilization in the study area. This result corroborates the findings of Kadafa et al. (2017) that most females use fuelwood primarily for cooking as the major source of domestic energy utilization, hence they are more adversely affected by the use of fuelwood compared to men. A larger proportion (38.3%) of the respondents fell within the 41 to 50 years age range, 25% were within the age range of 31 to 40 years and 16.7% were between 51 and 60 years while 15% were within the age range of 21 and 30 years. This implies that fuelwood utilization, especially for cooking is employed by all age groups in the study area. The mean age of 42 years implies that the respondents were still young and could cope with the stress of firewood gathering and utilization in the study area. This supports the findings of Odunuga and Akinbile (2015) that the majority of the respondents who exploited and utilized fuelwood in Ogun State were young and still possess enough strength, vigour and vitality to exploit fuelwood in a substantial amount. Distribution by educational qualification reveals that 42.5% of the respondents had primary education, 35% had secondary education and 9.2% had tertiary education while 13.3% had no formal education in the study area. This implies that the majority of the respondents, though had one form of education or the other, had a low educational level and this might have an implication on their standard of living as well as healthy living in the study area. This agrees with the findings of Ojo et al. (2012) that education is a major factor, especially in an economic unit where human hygiene matters. The majority (72.5%) of the respondents were married. This implies that the respondents were responsible for their family needs. The majority (57.5%) had between 6 and 10 people in their households. The mean household size of 9 persons implies that the respondents had a large household size and this might influence fuelwood utilization, especially for cooking in the study area. This is in line with the reports of Isma'il et al. (2014) that family size influences the demand for fuelwood in a household. The results further reveal that the majority (51.7%) of the respondents were farmers, 18.3% engaged in petty trading, 16.7% were in paid employment jobs and 13.3% were artisans. This implies that farming being the major occupation of the respondents can predispose them to utilize fuelwood in the study area.

Furthermore, 45.8% of the respondents earned between ₦20,100 and ₦40,000 monthly, 31.7% earned less than ₦20,000 while 22.5% earned more than ₦40,000 monthly in the study area. The mean monthly income of ₦26,380 implies that the economic status of the respondents is low and this could be a predisposing factor to fuelwood utilization which is cheaper and readily available when compared to other energy sources.

Sources of fuelwood in the study area

The result in Figure 1 shows that the majority (51%) of the respondents obtained their fuelwood from their farmland, 25% got it from nearby bushes and 18% got it from the forest while 6% purchased their fuelwood. This result implies that the dependence on fuelwood as an energy source may be connected to its availability, easy accessibility and affordability as 94% of the respondents got their fuelwood at no cost in the study area. This result is in tandem with the findings of Isma'il et al. (2014) that 53% of rural households in Ikara LGA of Kaduna State obtained their fuel-wood from their farmlands.

Health problems associated with fuelwood utilization in the study area

The results in Table 2 reveal that majority (85%) of the respondents had experienced at least one of the health

problems listed in Table 2 as a result of fuelwood utilization in the study area. The results show that 56.6% of the respondents had experienced eye irritation, 50.8% sneezed while cooking with fuelwood and 43.3% had breathing difficulty. Other health problems experienced by the respondents were cough (30.8%), catarrh (12.5%), asthma (11.7%) and headache (10%). This result implies that, although fuelwood is readily available and a cheap source of domestic energy, it poses a great threat to the health of the farming households in the study area. This result corroborates the findings of Kadafa et al. (2017) that respondents at Yelwa Village, Nasarawa State suffered from a variety of health problems such as eye irritation, cough, persistent sneezing and shortness of breath as a result of fuelwood utilization.

Table 1. Socio-economic characteristics of respondents in the study area (n = 120).

Variables	Frequency	Percentage (%)
Sex		
Female	91	75.8
Male	29	24.2
Age		
21-30	18	15.0
31-40	30	25.0
41-50	46	38.3
51-60	20	16.7
Above 60	6	5.0
Mean	**42.13 (±12.041)**	
Educational Qualification		
No Formal Education	16	13.3
Primary Education	51	42.5
Secondary Education	42	35.0
Tertiary Education	11	9.2
Marital Status		
Single	12	10.0
Married	87	72.5
Divorced	7	5.8
Widowed	14	11.7
Household Size		
1-5	40	33.3
6-10	69	57.5
Above 10	11	9.2
Mean	**9(±1.063)**	
Occupation		
Farming	62	51.7
Self-employed	16	13.3
Trading	22	18.3
Paid employment	20	16.7
Monthly Income		
≤20,000	38	31.7
20,100-40,000	55	45.8
>40,000	27	22.5
Mean	**26,380 (±1212.275)**	

Source: Field survey, 2020

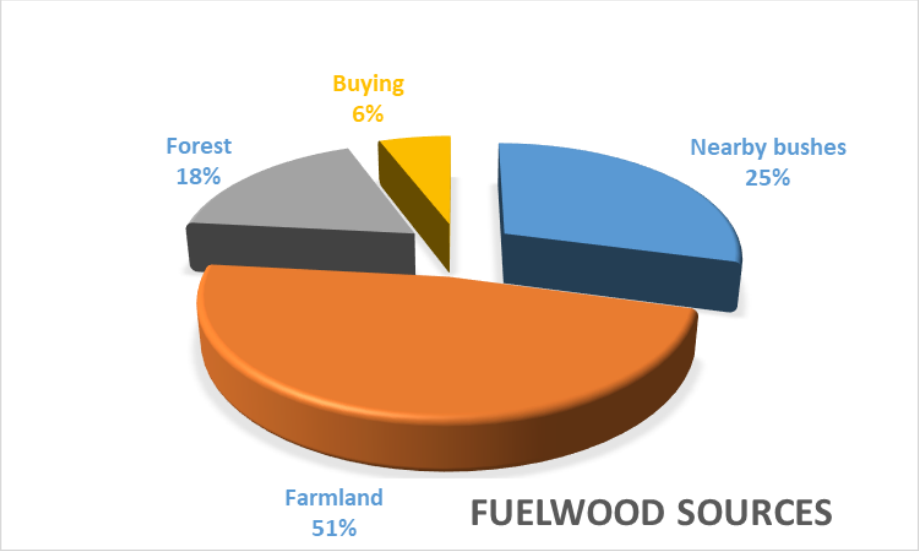

Figure 1. Sources of fuelwood used for cooking in thestudy area

Determinants of health effects of fuelwood utilization among farming households in the study area

The result of the probit regression analysis on the determinants of the health effects of fuelwood utilization among farming households in the study area is presented in Table 3. The Chi-square value of 230.961 ($p<0.01$) implies that the model fits the data well. The result reveals that sex ($p<0.05$), marital status ($p<0.05$), household size ($p<0.01$), primary occupation ($p<0.01$) and income ($p<0.05$) were the factors determining the health effects of fuelwood utilization among the farming households in the study area.

Table 2. Health problems associated with fuelwood utilization in the study area.

*Health problems	Frequency	Percentage %
Suffered health problems	102	85
Eye irritation	68	56.6
Sneezing	61	50.8
Breathing difficulty	52	43.3
Cough	37	30.8
Catarrh	15	12.5
Asthma	14	11.7
Headache	12	10.0

Source: Field Survey Data, 2020 *Multiple responses

The marital status of the respondents was found to have a positive significant relationship with the health effects of fuelwood utilization in the study area. This implies that married respondents were more likely to experience health problems occasioned by fuelwood utilization than unmarried respondents in the study area. This is because married respondents require more domestic energy to cater to their family needs. Odunuga and Akinbile (2015) and Kadafa et al. (2017) reported similar results. In the same vein, household size and primary occupation of the respondents were positive and significant at 1% alpha levels respectively. This implies that these variables increase the probability of the respondents experiencing health problems as a result of fuelwood utilization in the study area. The larger the household size, the more fuelwood required, the more exposure to smoke emitted from fuelwood combustion and the higher the adverse effects on the health of users. This result is in consonance with the findings of (Vivan et al. 2012; Piabuo and Puatwoe, 2020) that the combustion of solid wood fuel emits smoke with particles that have adverse effects on the health of users. Also, the primary occupation of the respondents being farming predisposed them to utilize fuelwood due to its affordability and accessibility, this increases their exposure to smoke from fuelwood combustion and consequently, health problems associated with fuelwood utilization in the study area. The income of the respondents was also found to have a positive significant relationship with the health effects of fuelwood utilization at 5% alpha levels in the study area. This implies that farming households with higher incomes have a higher likelihood of experiencing health problems as a result of fuelwood utilization in the study area. This result is surprising as higher income is expected to enhance the capacity of using renewable energy sources such as kerosene or LPG thereby reducing the health effects of fuelwood utilization but this result is a pointer to the fact that renewable/cleaner energy sources such as kerosene, electricity and LPG were not only very

expensive but also very scarce in the study area. This result confirms the findings of Onyekuru and Eboh (2011) that those with better income buy more fuelwood which was cheaper in the rural areas thereby increasing their exposures to health consequences of using fuelwood. Conversely, the sex of the respondents was found to have an indirect significant relationship with the health effects of fuelwood utilization at a 5% level of probability in the study area. This implies that the likelihood that farming households would experience health problems as a result of fuelwood utilization is higher in women than men. This is not unexpected as women were chiefly responsible for cooking and therefore have higher exposures to fuelwood combustion than men in the study area. This result supports the reports of WHO, (2007); Piabuo and Puatwoe (2020) that, there is a high association between fuelwood combustion and a high risk of chronic bronchitis and chronic obstructive pulmonary disease, especially asthma and cataract among women. Badamassi et al. (2018) equally reported that combustion of particulate matter (PM2.5) has a greater adverse effect on women's life expectancy in the long run.

Table 3. Determinants of health effects of fuelwood utilization among farming households in the study area.

Variable	Coefficient	S.E	Z-value
Age	0.137	0.100	1.370
Sex	-0.143**	0.076	-2.168
Education	-0.015	0.041	-1.374
Marital status	0.133**	0.066	2.008
Household size	0.095***	0.038	2.525
Occupation	0.148***	0.057	2.593
Income	0.000**	0.000	2.212
Constant	-2.955	0.290	-10.177
chi^2	230.961***		9.675

*** Significant at 1%; ** Significant at 5%
Source: Computed from Field Survey Data, 2020

CONCLUSION

Based on the findings of this study, it can be concluded that fuelwood utilization had negative effects on the health of farming households in the study area. The major health problems experienced by the respondents were eye irritation, sneezing, and breathing difficulty. Consequently, the sex of the respondents, marital status, household size, primary occupation and income were the drivers of health effects of fuelwood utilization among the farming households in the study area. Therefore, an alternative source of fuel such as kerosene and cooking gas should be made readily available to farm families at subsidized and affordable prices. This will encourage a shift from the reliance on unhealthy and environmentally unfriendly fuelwood to more sustainable sources of energy. Also, Government, both at federal and state levels, may also promote a solar-powered cooking stove program in the rural area. Improved versions of biomass stoves developed locally by the Energy Commission of Nigeria through its energy research centres at the University of Nigeria, Nsukka and Usman Dan Fodio University in Sokoto should be promoted. An elaborate awareness programme by the government to disseminate and encourage the adoption of such technology by the households nationwide as the case of our neighbouring countries like Niger, Cameroon and Senegal should be put in place. Furthermore, Local government agencies and non-governmental organizations should embark on public enlightenment campaigns to inform the farm families on the consequences of fuelwood consumption on their health, climate, environment and biodiversity.

REFERENCES

Babalola, F.D. Harnessing energy crisis and gender empowerment: Impacts of household energy consumption pattern on women welfare and education. A conference discussion paper. 2010, Retrieved: http://www.e4conference.org/e4e

Badamassi, A.; Xu, D.; Mahaman, Y.; Boubacar, H. The effects of PM2.5 from household combustion on life expectancy in sub-Saharan Africa. *Int Jour of Env Research and Public Health*, 2018, 15(4), 748.

FAO. Food and Agriculture Organisation of the United Nations: for a world without hunger. 2009.

Isma'il, M., Maiwada, A.; Bashir, A.; Musa, I. J.; Adamu, G.; Babajo, H. Comparative analysis of fuelwood utilization in-and-aroud Ikara Local Government Area of Kaduna State, Nigeria. *Global Jour of Res & Rev*., 2014, 1(3), 125-135.

Jagger, P.; Shively, G. Land use change, fuel use and respiratory health in Uganda. *Energy Pol.,* 2014, 67, 713-726. doi: 10.1016/j.enpol.2013.11.068.

Kadafa, A. A.; Medugu, N. I.; Stephen, D. K.; Medan J. D. wood utilization on users in Yelwa Village, Nasarawa State, Nigeria. *Intl Jour of Sci: Basic and Applied Research*., 2017, 24(6), 174-191.

Mbanya, V.; Sridhar, M. PM10 emissions from cooking fuels in Nigerian households and their impact on women and children. *Health*, 2017, 9, 1721-1733. DOI: 10.4236/health.2017.913126.

Mohapatra, I.; Das, S.C.; Samantaray, S. Health impact on women using solid cooking fuels in rural area of Cuttack district, Odisha. *Jour of Fam Med and Pry Care*, 2018, 7, 11-15.

Nnaji, C.E.; Uzoma, C. C.; Chukwu, J.O. Analysis of factors determining fuelwood use for cooking by rural households in Nsukka Area of Enugu State, Nigeria. Continental Journal of Environmental Sciences, 2012, 6(2), 1-6.

Odunuga, A.O.; Akinbile, L.A. Determinants of perceived health and environmental effects of fuelwood exploitation among farm families in Ogun State, Nigeria. Journal of Agricultural Extension, 2015, 19(2), 134-145.

Ojo, O.S.; Okonkwo, M.C.; Oladele, O.N.; Jayeoba, W.A.; Suleiman, R.A.; Yakubu, M. Evaluation of wood fuel exploitation and its relative consumption pattern in Kaduna Metropolis. Journal of Edu & Soc Res, 2012, 2(7), 134-143.

Onyekuru, N. A.; Eboh, E. C. Determinants of cooking energy demand in the rural households of Enugu State, Nigeria: An application of the bivariate probit model. *Asian J. Exp. Biol. Sci.,* 2011, 2(2), 2011: http://www.abebs.com.

Piabuo, S.M.; Puatwoe, J.T. Public health effects of wood fuel in Africa: Bioenergy from tree commodities as a sustainable remedy. IntechOpen, 2020, DOI: http://dx.doi.org/10.5772/intechopen.90603.

Sa'ad, S.; Bugaje, I.M. Biomass consumption in Nigeria: Trends and policy issues. Jour of Agric & Sust, 2016, 9(2), 127-157.

Scheid, A.; Hafner, J.M.; Hoffmann, H.; Kächele, H.; Uckert, G.; Sieber, S.; Rybak, C. Adapting to fuelwood scarcity: The farmers' perspective. Front. Sustain. Food Syst., 2019, 3, 28. doi: 10.3389/fsufs.2019.00028.

Tao, S.; Cao, J.; Kan, H.; Li, B.; Shen, G.; Shen, H. Residential solid fuel combustion and impacts on air quality and human health in mainland China. Global Alliance for Clean Cook stoves. 2016.

The Solar Cooking Archive. Fuelwood as a percentage of energy consumption in developing countries. Retrieved on 23th August, 2012 from:http://solarcooking.org/fuelwood.htm.http://solarcooking.org/fuelwood.htm.

Vivan, E.L.; Ezemokwe, I.U.; Aluwong, G.S. Health effects of biomass energy use in rural households in Kanai (Mali) District of Zangon-Kataf Local Government Area, Kaduna State, Nigeria. *J. Env Mgt & Safety*, 2012, 3(6), 28-39.

WHO. Indoor air pollution: national burden of disease estimates. World Health Organization Geneva, Switzerland: WHO, Switzerland: WHO Press; 2007.

Zidago, A.P.; Wang, Z. Charcoal and fuelwood consumption and its impacts on environment in Cote d'Ivoire (case study of Yopougon area). *Environment and Natural Resources Research*, 2016, 6(4), DOI: 10.5539/enrr. v6n4p26