

SUBTITUTING FUEL WOOD WITH COOKING GAS FOR THE SUSTAINABILITY OF FOREST IN NIGERIA

BY

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ABSTRACT

The increasing use of fuel wood by households in Nigeria is of high side. From 139578000 cu meters in 2007 to 1777996000cu meters in 2016. Its soaring repercussions in the socio-economic milieu of micro environment of Nigeria is alarming. Therefore the front matter of this paper is to examine the continuous burning of fuel wood and its contributing effect to global warming. The objectives are: to identify and compare the use of fuel wood and natural gas as sources of domestic energy in the study area to assess the impact of fuel wood consumption on forest sustainability, to suggest possible solutions such as swapping natural gas for fuel wood as domestic source of energy in Nigeria. The research work based its targeted population on elites which is about 12.6 million (Knacad, 2018). This based on the sample size table of the research advisors (2006), a total of 705 copies of questionnaire were administered to respondents through soft copy sent on Google and other social media handles. Special Package for Social Scientists (SPSS) was applied through automatic process of data from Google. Result of the research showed that fuel wood is still consumed in high quantity. Although many homes now have a cooking gas of varying sizes, nevertheless, they still support the cooking has with the use of fuel wood for financial reasons. The research work therefore recommends that the government should as a matter of urgency reduce the price of cooking gas to make it affordable for all and sundry. Also laws should be enacted and enforced against the consumption of fuel wood for energy source. This will go a long way to eradicate gas flaring thereby making a sustainable environment highly achievable.

Keywords: Fuel wood, Cook gas, Sustainability, Forest.

INTRODUCTION

Buchana (1974) defines vegetation as collection of plants or flora of an area. This vegetation varies from forest to grassland and desert. The noteworthiest is the forest, defined by Jeje and Adesina (2010) as the plant formation which is dominated by woody species as trees or shrubs. Trees of the forest can be closely spaced to form canopy with continuous stratum which gives shades to the underground smaller plants like moss and fern. In Nigeria these forests are found in Southwest and East astronical rainforest and in south-south as mangrove and fresh water forests. The tropical rain forest is the most important occurs in climates with both high and constant temperature and humidity, an annual precipitation of over 2000mm and not less than 1200mm in the driest months. It is the richest vegetation formation in the world (Jeje and Adesina, 2010) as a result of its numerous species. Few examples of the species include Melicia excelsa, Khaya grandifolia, Ceiba Pataudasa, etc. Robinson (1972) highlighted by Dyaji (2013) that plants have manifold

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and wide range uses which are grouped into tenfold as: human foodstuffs, animal food stuffs, industrial raw materials, chemical products, constructional materials, fuel, ecological uses, microorganisms, technological uses and aesthetic uses. The only ameliorator to climate change cum global warming problem is forest Oloyede, 2019; the following are the summarized characteristics of tropical rain forest:

- i. The forest contains large trees approximately 50m high;
- ii. It contains a variety of plants which are close together forming a dense canopy;
- iii. The forest forms layers viz upper, middle and ground layers;
- iv. trees are huge and tall often develop buttress not, with which they withstand storms;
- v. The forest is ever green since growth, seedling, flowering, fruiting, shedding of leaves and decaying all continue at different times of the year;
- vi. There are lots of diverse species e.g. 200 or more within a square kilometer;
- vii. There are series or diverse undergrowth such as woody climbers or lianas, ferns and mosses, etc.
- viii. There is rapid decomposition hence no accumulation of rotten vegetation in the biomas etc. (Smith, 2023).

However, according to United Nations Food and Agricultural Organization (UNFAO, 2011) that 9.9% or about 9,041,000ha of Nigeria is forested, as at then 382,000ha was planted forest. Between 1990 and 2010, Nigria lost an average of 409,650ha or 2.3% per year. In total between 1990 and 2010, Nigeria lost 47.5% of its forest over, or around 8,193,000ha.

In 2018, forest area for Nigeria was 219,536sq.km. Forest area of Nigeria fell gradually from 250,563sq.km. in 1999 to 219,536sq.km in 2018 (Knoema, 2020).

Date	Value	Change in Percentage (%)
2018	219,536	-0.74%
2017	221,169	-073%
2016	222,801	-0.73%
2015	224,435	-0.72%
2014	226,068	-0.72%
2013	227,701	-0.71%
2012	229,334	-0.71%
2011	230,967	-0.70%
2010	232,600	-0.70%
2009	234,233	-0.69%
2008	235,866	-0.69%
2007	237,499	-0.69%

 Table 1: Gradual decrease in Nigeria forest Area (2007 – 2018)

Source: Knoema (2020).

National Population Commission (2006) published among its result of the census the distribution of regular households by type of main cooking fuel across the nation. The table showing 36 states of the federation and FCT the numbers of households that use different cooking fuels ranging from electricity, gas, kerosene, firewood, coal, animal dung/saw dust/coconut husk, solar and other.

Of the 28,197,085 households in Nigeria as at that time 16,063,532 households which is 56.97% use wood. This is only wood fuel not to mention charcoal and saw dust which are further products of wood. This can quail the remaining forest if this act is left unabated.

Nigeria has 187 trillion cubic feet (TCF) of proven natural gas reserves, she ranks 9th in the world and accounting for about 3% of the world's total natural reserves of 6,923 TCF (Worldmeter, 2017). She produces 3,009,650.25million cubic feet (MMcf) of natural gas per year as of 2015, ranking 12th in the world. She consumes 609,290million cubic feet (MMcf) as of the year 2017, accounting for about 0.5% of the total world consumption of 132,290,211 MMcf ranking 38th in gas consumption. The yearly gas consumption is 0.3% and net export is 0.5% her proven reserves is 99.2% British Petroleum (BP, 2017) and US Energy Information Administration (EIA, 2017). This information on yearly gas of local consumption of

0.3% in Nigeria is congruous to NPC (2006) table of distribution of regular households use of type of cooking fuel in Nigeria. Of the total 28,197,085 households, just 724,620 households were using gas for cooking accounting for 2.7%, that was when economy of Nigeria was a bit fair than what we have now.

					Type of Main Co	oking Fuel			
State	Total	Electricity	Gas	Kerosene	Fire-Wood	Coal	Animal dung/Sawdust/ Coconut Husk	Solar	Other
JIAbia	605 987	10.683	14,891	229,222	346,609	2,102	1,315	376	789
n Adamawa	576 348	36 200	3.982	58,452	455,847	17,162	2,415	742	1,548
2 Akura Ibom	857 436	53,809	24,370	231,844	535,619	8,471	1,869	631	823
4 Anambra	882 875	149.071	39,098	301,744	356,144	29,651	3,641	1,752	1,774
4 Anamora	847 731	68,189	9,486	93,348	637,392	19,824	16,794	1,646	1,052
o Baucia	352 025	5 502	9,209	154,419	177,119	4,012	773	406	585
7 Bapus	801 833	48,260	6,067	75001	527,030	37,749	2,558	775	993
7 Denue	787 274	45 434	7,233		615,134	12,694	15,020	1,729	2,355
	645 251	15,964	9,390	*** 184	435.065	3,678	1,576	566	828
9 Closs River	800 312	84.348	28.848	201 +52	424,875	53,440	8,980	1,834	1,525
10 Dena	449 709	38 093	4.614	70 091	303,400	27,539	2,261	1,680	2,031
th Edo	701.073	42 732	21,165	231,666,	394,396	7,181	2,155	599	1,179
12 E00	403 739;	22 987	8.351	177,454	270,335	12,249	1,349	430	584
	725 767	57,336	17.325	174,470	415,608	54,097	3,388	2,021	1,522
14 Enugu	419 226	25 125	4,7841	50,196	328,165	5,163	4,486	531	776
15 Gombe	837 105	117 823	24 386	196,263	476,973	15,464	2,829	1,602	1,855
16 100	810.210	120 011	15 414	91,195	520,913	37,679	11,497	1,895	1,806
17 Jigawa	1 115 974	48.061	20 212	218.664	810,433	10,275	3,657	1,424	3,248
18 Kaduna	1,110,974	218 313	49 305	241.187	950,749	24,829	11,422	3,914	3,616
19 Kano	1,003,333	185 100	25.312	139,926	679,134	23,842	7,885	3,130	1,888
20 Katsina	1,000,310	62,810	6.076	51 615	412,891	22,888	3,263	1,218	1,066
21 Kebbi	002,021	22.545	7 808	160.935	437,952	9,609	1,694	355	658
22 Kogi	641,000	21,545	5.097	113 537	248,024	76,663	2,052	721	1,023
23 Kwara	400,700	76 005	141 104	1 771 036	140,651	51,679	3,045	965	10,367
24 Lagos	2,193,042	11 656	3 679	59,299	259,912	5,738	1,318	425	684
25 Nasarawa	342,711	27 364	7 215	102.341	571,254	17,465	2,034	604	1,68
26 Niger	729,904	29 607	14 659	470,223	343,119	19,833	2,613	365	1,540
27 Ogun	762,020	24 909	8 864	229,806	479,944	13,933	3,820	700	1,04-
28 Ondo	703,020	44.678	12 548	273 030	349,150	46,214	2,711	684	1,29
20 Osun	1 249 405	45 358	20.640	531,731	514,660	127,602	4,691	1,239	2,184
30[Uyo	1,248,105	12 872	6 520	100 463	451,997	23,018	6,756	400	1,465
31 Plateau	604,491	27.025	95 952	549 789	437,204	7,671	2,193	1,081	2,168
32 Rivers	1,123,998	60,933	8 6201	75 930	512,324	20,478	6,725	1,967	2,084
33 Sokoto	688,710		3 262	47 652	333,453	13,636	2,322	644	848
34 Taraba	431,385	23,377	2 921	41 483	323 272	15.327	8,221	829	99
35 Yobe	418,9991	25,041	11 020	74 014	381,192	14.229	4,024	1,777	1,39
36 Zamfara	592,106	100,540	20.374	143 456	105 593	6.991	337	129	1,53
37 FCT Abuja	303,592	15,175	704 600	8 067 203	16 063 532	906.080	163,694	41,786	62,82

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Of all the cooking fuels, gas ranks next to electricity in neatness and nearing harzadous free to the environment. Gas is got from the mixture of gaseous hydrocarbons associated with petroleum deposits; mostly methane (CH₄) with smaller amounts of ethane, propane and butane. Its methane content is not as much as that of cattle that emit a large amount of it (CH₄). This shows that herds of cattle is more dangerous than natural gas in methane emission into the atmosphere. Spring power and gas (2020) listed advantages of natural gas in the following ways:

- i. it is abundant and a major source of energy,
- ii. infrastructure already in place
- iii. can be easily transported,
- iv. produces less over all pollution,
- v. it emits carbondioxide that flowering plants need for photosynthesis,
- vi. it doesn't produce carbon thereby makes cooking utencils clean during cooking.

In its contribution to the advantages of natural gas as cooking fuel to other fuels, consumer gas cooperative (2017) also listed the following points:

- 1. natural gas as environmental friendly because it burns cleaner than the other fossil fuel,
- 2. it is safer and easier to store when compared to other fossil fuels,
- 3. natural gas is extremely reliable, unlike electric power that can be knocked out during a storm or at will by authority handling it,
- 4. it is less expensive than other sources of fuels, etc.

Source: National Population and Housing Census, Federal Republic of Nigeria (2006)

OBJECTIVE

The main objective of this research work is to examine the continuous burning of fuel wood and its contributing effect to global warming. Other objectives are:

- i. to identify and compare the use of fuel wood and natural gas as sources of domestic energy in the study area,
- ii. to assess the impact of fuel wood consumption on forest sustainability,
- iii. to suggest ways by which natural gas can be swapped for fuel wood as a domestic source of energy

HYPOTHESES

Hypothesis 1 (Ho₁): There is no correlation between the use of wood and drastic reduction of forest in Nigeria

Hypothesis 2 (Ho₂): There is no correlation between the use of wood for fuel in both urban and rural area. Hypothesis 3 (Ho₃): Cooking gas is not a good substitute for fuel wood.

RSEARCH METHODOLOGY

The research work based its targeted population on elites which is about 12.6million (Knacad, 2018). Based on the sample size table of the research advisors (2006) a total of 705 copies of questionnaire were administered to respondents in the study area for 95% of confidence and 5% level of error. Soft copy questionnaire was sent via Google and other social media handles on-line. Special Package for Social Scientists (SPSS) was applied through automatic process of data from Google. Apart from descriptive analysis, correlation coefficient and chi-square were the tools of the inferential analysis.

3.1 Area of the Study

Nigeria is situated in four different climate zones viz: the monsoon climate in the Niger-Delta, the tropical savannah climate in the middle belt and parts of the southwest, the warm semiarid climate in north west and the warm desert climate in the northeast. Forest is found in the Monsoon climate and the tropical savannah. An enclave of the north where forest can be found is the pleateau due to the effect of the high table land called pleateau. The last two climate viz warm semi arid and the warm desert support grasses called savannah in West Africa. These two vegetations are found in Nigeria, that is forest to the south and savannah to the north.

Forest can be sub-divided into Rainforest found in Niger River Delta, which is characterized by the precipitation level of 1500-2000mm about 8-9months of rainfall. It spreads to the southwest, southwest and cross river. It contains trees of 40-45 meters high above the sea level, few examples are: Iroko (Milicia excels), Sapale (Entradrophragma cylindricum), Obeche (Triplochiton scleroxylon), African Walnut (Tetracarpidium conophorum), Mahogany (Swietenia macrophylla), etc. The second is the Mangrove forest found around the marshes of the coastal creeks, Lagoons and estuaries of southern Nigeria. Trees found there are palm trees, mangroves (both red and white) and lianas. Legit Newspaper (2020) lists these four usefulness of forest to Nigerians:

- 1. the juice of urine palm is used for wine making;
- 2. Kaya, Opepe, Sapele, Iroko and Ogba are used as timber for construction and ornaments;
- 3. Candelabra shaped pandanus is the source of leaves, which are used for basket making and weaving mats;
- 4. The wood from garcinia kola is a source for chewing sticks production. Above all these, the forest protects soil from erosion and leaching. Dead leaves and trunk add to the soil nutrients. The forest is the habitat of wild animals, the forest moderates the climate of its immediate environment. The greatest of all is that it is the solution for ameliorating the effect of climate change/global warming which is tougher than COVID 19 pandemic for now.

3.2 Data Collection

The information gathered for this project was majorly through the administration of questionnaire which were presented and analysed. This subsections include questionnaire survey on Substituting fuel wood with cooking gas for the sustainability of forest in Nigeria, based on the information gathered from various respondents.

3.3 Reliability of the Data Collected

An online survey was carried out on Substituting fuel wood with cooking gas for the sustainability of forest in Nigeria of which seven hundred and five (705) people responded. This enables for the generation of seven hundred and five (705) responses which were used for the analysis of this study.

4. **RESULT AND DISCUSSION**

Table 5: Respondents responses to the stems of the questionnaire			

S/N	ITEMS	Str	on <mark>gly</mark>	Agreed		Disagreed		agreed Strong	
		Agree				Disagree			
		F	%	F	<mark>%</mark>	F	%	F	%
1	Many Nigerians use wood as	145	20.57	<mark>35</mark> 8	50.78	169	23.97	33	4.68
	their domestic heat energy,								
	especially for cooking.							\bigcirc	
2	This act of increase in wood	256	36.31	323	45.82	122	17.30	4	0.57
	consumption drastically								
	reduces the Nigeria forest.					1	-		
3	This singular act of lots of	1 <u>6</u> 3	23.12	<mark>32</mark> 6	46.24	180	25.53	36	5.11
	Nigerians ruin fo <mark>rest</mark> more than								
	farming and lumbering.								
4	This act of using wood for fuel	83	11.77	<mark>45</mark> 0	63.83	116	16.45	56	7.94
	is being practiced both in urban				-				_
_	and rural areas of the country.	170	04.11	2.62	51.40	104	10.01	20	5.00
5	Both valuable trees and those	170	24.11	363	51.49	134	19.01	38	5.39
	that are not, are felled for fuel								
6	Wood.	102	17.45	200	52.00	171	24.26	21	1.40
0	woods are transported from	123	17.45	380	53.90	1/1	24.26	51	4.40
	demostic upo for cooking								
7	The country is facing source	145	20.57	271	52.62	158	22.41	21	4.40
/	forest resources devastation due	143	20.57	5/1	52.02	138	22.41	51	4.40
	to this singular act of wanton					-			
	cutting of wood for fuel	ala "	Theo	110	h lo	h OV	ohio	0	
8	We cut short the importance of	219	31.06	393	55 74	71	10.07	22	3.12
0	the forest to us as we imbibe in	217	51.00	575	55.71	/1	10.07		5.12
	this attitude of this forest								
	destruction.								
9	There is a good substitute for	309	43.83	318	45.11	57	8.09	21	2.98
	fuel wood, cooking gas is great.								
10	It doesn't show smoke, it's neat	342	48.51	258	36.60	89	12.62	16	2.27
	and good for all categories of								
	people.								
11	Its uses are more	342	48.51	271	38.44	48	6.81	44	6.24
	environmentally friendly than								
	using wood.								
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12	Nigeria has natural gas that can	300	42.55	312	44.26	52	7.38	41	5.82
	be converted to cooking gas in								
	excess.								
13	Mass diversion to cooking gas	217	30.78	367	52.06	77	10.92	44	6.24
	can stop gas flaring in the								
	country which is another								
	solution to curbing global heat.								
14	There should be easy access to	350	49.65	268	38.01	44	6.24	43	6.10
	gas to all and sundry for								
	cooking and the price should be								
	very low for general								
	affordability.								
15	The use of wood for domestic	117	16.60	301	42.70	195	27.66	92	13.05
	heat energy should henceforth								
	be promulgated as a crime.								

Source: Field work (2021)

From the table 3 above, 71.35% of the respondents agreed to the fact that many Nigerians use wood as their domestic heat energy, especially for cooking. On the act of increase in wood consumption which drastically reduces Nigeria forest, 82.13% acceded to it. On the third stem of the questionnaire that says this singular act lots of Nigerians ruin forest more than farming and lumbering, 69.36% agreed to it. 75.6% of the respondents conceded that both rural and urban dwellers in Nigeria engage in using wood for fuel in cooking. Just like on the responses of these respondents above, the lion share of them which is 75.6% also agreed to the fact that both valuable trees and those that are not are felled for fuel wood. 71.35% conceded that wood are transported from rurals to various urbans to sell for domestic use for cooking.

On the stem 7 of the questionnaire which indicated that the country is facing severe forest resources devastation due to this singular act of wanton cutting of wood for fuel. 73.19% agreed to the statement. 86.8% unequivocally alluded to the statement that we cut short the importance of the forest to use as we imbibe in this attitude of this forest destruction. 88.94% opined that there is a good substitute for fuel wood and that cooking gas is great, 85.11% believed that cooking gas does not show smoke, and that it is neat and good for all categories of people. 86.95% opined that the uses of cooking gas is more environmental friendly than wood. 84.81% succintly pointed out that Nigeria as a country has enough natural gas that can be converted to cooking gas. 82.84%, 87.66%, and 59.30% all agreed to the facts that massive diversion to cooking gas can stop gas flaring in the country which is another solution to curbing global heat. There should be easy access to gas for all and sundry and that the price should be very low for general affordability. And that the use of wood for domestic heat energy should henceforth be promulgated as crime.

4.1 Hypothesis Testing 1

Hypothesis 1 (H¹): There is no correlation between the use of wood and drastic reduction of forest in Nigeria.

Apart from the descriptive analysis presented in Tables 3 above, an inferential analysis (correlation analysis) was also carried out to establish the relationship between use of wood and forest reduction in Nigerian. The analysis in Table 4.4a and 4.4b showed that the use of wood for fuel have a statistically significant relationship with forest reduction in Nigeria.

Table 4a:

Correlations			
		Many Nigerians use wood as their domestic heat energy, especially for cooking.	This act of increase in wood consumption drastically reduces the Nigeria forest.
Many Nigerians use wood as their domestic	Pearson Correlation	1	.428**
heat energy, especially	Sig. (2-tailed)		.000
for cooking.	Ν	705	705
This act of increase in wood consumption	Pearson Correlation	.428**	1
drastically reduces the	Sig. (2-tailed)	.000	
Nigeria forest.	Ν	705	705
**. Correlation is signific	ant at the 0.01 level a	at 0.5 or 5% significant level(2-1	ailed).

Source: SPSS Correlation Calculation (2023)

Table 4b:				
Correlations				
			Many Nigerians use wood as their domestic heat energy, especially for cooking.	This act of increase in wood consumption drastically reduces the Nigeria forest.
	Many Nigerians use wood as their domestic	Correlation Coefficient	1.000	.434**
	heat energy, especially for cooking.	Sig. (2-tailed)		.000
Spearman's		Ν	705	705
rho	This act of increase in wood consumption	Correlation Coefficient	.434**	1.000
	drastically reduces the	Sig. (2-tailed)	.000	
	Nigeria forest.	Ν	705	705
**. Correlation	n is significant at the 0.01 le	evel at 5% significant	level (2-tailed).	

Source: SPSS Correlation Calculation (2023)

A multiple correlation analysis of both Pearson and Spearman was run to test the hypothesis one (HO₁): There is no correlation between the use of wood and drastic reduction of forest in Nigeria). The analysis in Table 4a above showed the analysis of the relationship between the use of wood as domestic heat energy, especially for cooking and drastic reduction of forest in Nigeria. The results for both Pearson and spearman ranking showed that there is moderate correlation/relationship of 0.428 and 0.434 respectively which falls between the range of positive moderate correlation (>0.3-<0.7). The nature of the correlation is positive and the strength moderate with its significant level for both Pearson and spearman at 0.001 at 0.5 or 5% significant level which shows that the correlation is significant (<0.5= significant >0.5= insignificant).

Therefore, the relationship between the use of wood as domestic heat energy, especially for cooking and drastic reduction of forest in Nigeria is significant at 0.001 with positive moderate correlation.

Hypothesis 2 [H²]: There is no correlation between the use of wood for fuel in both urban and rural area.

Apart from the descriptive analysis presented in Table 3, an inferential analysis (correlation analysis) was also carried out to establish the correlation between the use of wood both in urban and rural area in Nigeria. The analysis in table 5a and 5b showed that the use of wood for fuel have a significant relationship both in urban and rural area in the country.

Table 5a:						
Correlations						
		There is a go fuel wood, great.	ood substitute for cooking gas is	Its u environm using wo	ses are more lentally friendly than od.	
There is a good Pearson substitute for fuel Correlat		1		.627**		
wood, cooking great.	g gas is <u>Sig. (2-tailed)</u> N	705		.000		
Its uses are environmentall	e more Pearson V Correlation	.627**		1		
friendly than	using Sig. (2-tailed)	.000				
wood.	N	705		705		
**. Correlation	is significant at the 0.01	level at 0.5 or 5% l	evel of significan	ce (2-taile	d).	
Source: SPSS C Table 5b:	Correlation Calculation (2023)				
Correlations						
			There is substitute f wood, cookin great.	a good for fuel ng gas is	Its uses are more environmentally friendly than using wood.	
	There is a good substitute for fuel	Correlation Coefficient	1.000		.605**	
	wood, cooking gas is	Sig. (2-tailed)			.000	
Spearman's great.		N	705		705	
rho	Its uses are more environmentally	Correlation Coefficient	.605**		1.000	
	friendly than using	Sig. (2-tailed)	.000			
	wood.	Ν	705		705	
** Correlation	is significant at the 0.01	level (2-tailed)				

Source: SPSS Correlation Calculation (2023)

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A multiple correlation analysis of both Pearson and Spearman was also run to test the hypothesis two (H2): that states there is no correlation between the use of wood for fuel in both urban and rural are in Nigeria. The analysis in table 5 above showed the analysis of the relationship between the use of wood for fuel in both urban and rural areas in Nigeria. The results gotten from both Pearson and spearman ranking showed that there is moderate correlation of 0.627 and 0.605 respectively which ranges between the range of positive moderate correlation (>0.3-<0.7 or according to some other correlation coefficient between 0.5-0.79) The nature of the correlation is positive and the strength moderate with its significant level for both Pearson and spearman at 0.001 at 0.5 or 5% significant level which shows that the correlation is significant (<0.5= significant >0.5 = insignificant). The correlation between the use of fuel wood for fuel gas in both rural and urban area in Nigeria is 0.001 for both Pearson and Spearman which implies that the correlation between them is significant.

Therefore, the relationship between the use of wood for fuel in both urban and rural area is significant at 0.001 with positive moderate correlation.

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Hypothesis 3 (H³): Cooking gas is not a good substitute for fuel wood.

Aside the descriptive analysis presented in table 3, an inferential analysis which involve the use of Chisquare (correlation analysis) was also employed to test the hypothesis 3 (Cooking gas is not a good substitute for fuel wood). The analysis in table 6a and 6b shows the significance of cooking gas as to whether it is a good substitute for fuel wood or not.

Table oa:						
Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	Ν	Percent	Ν	Percent	Ν	Percent
There is a good substitute for fuel wood, cooking gas is great. * It doesn't show smoke, it's neat and good for all categories of people.	705	100.0%	0	0.0%	705	100.0%

Source: SPSS Correlation Calculation (2023)

Table 6b:

T 11 (

There is a good substitute for fuel wood, cooking gas is great. * It doesn't show smoke, it's neat and good for all categories of people.

Cross tabulation

	It doesn't sh all categorie	Total					
			Strongly Disagree	Disagree	Agree	Strongly Agree	
	Strongly	Count	0	18	3	0	21
	Disagree	Expected Count	.5	2.7	7.7	10.2	21.0
There is a good	Disagree	Count	10	47	0	0	57
substitute for fuel		Expected Count	1.3	7.2	20.9	27.7	57.0
wood, cooking	Agree	Count	3	16	221	78	318
gas is great.		Expected Count	7.2	40.1	116.4	154.3	318.0
	Strongly	Count	3	8	34	264	309
	Agree	Expected Count	7.0	39.0	113.1	149.9	309.0
Total		Count	16	89	258	342	705
10(a)		Expected Count	16.0	89.0	258.0	342.0	705.0

Source: SPSS Correlation Calculation (2023)

Table 6c:

Chi-Square Tests			
	Value	Df	Asymp. Sig (2-sided)
Pearson Chi-Square	747.530 ^a	9	.000
Likelihood Ratio	609.690	9	.000
Linear-by-Linear Association	351.976	1	.000
N of Valid Cases	705		
a. 3 cells (18.8%) have executed count is .48.	pected coun	t less than :	5. The minimur

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Symmetric Measures			
		Value	Approx. Sig.
Nominal by Nominal	Phi	1.030	.000
	Cramer's V	.595	.000
N of Valid Cases		705	
a. Not assuming the null hypothesis.			
b. Using the asymptotic standard error assuming the null			
hypothesis.			

Table (J.

A Chi-square analysis was run to test the hypothesis three (HO₃): Cooking gas is not a good substitute for fuel wood in Nigeria. The analysis in table 6 above showed the analysis of whether cooking gas is a good substitute for fuel wood or not in Nigeria. The results got from the analysis show that there are expected count of 18.8% lesser than 5 with minimum expected count to be 48 which falls under Chi-square assumption that says Expected count must not exceed 20%. It has Pearson Chi-square value of 747.530 with 1° (One degree) level of freedom, and has significant level at 0.001 at 0.5 or 5% level of significant which is less than 0.5 (<0.5) and makes it statistically significant (<0.5= significant >0.5 = not significant). The analysis showed that there is moderate relationship of 0.595 which falls between the range of positive moderate correlation ((>0.3 - <0.7)) or according to some other correlation coefficient between 0.5- 0.79). The nature of the correlation is positive and the strength moderate with its significant level at 0.001 at 0.5 or 5% significant level which shows that the correlation is statistically significant.

Therefore, for this research, since there exist significant level of relationship in all the analyses conducted, we therefore reject the null hypotheses and accept the alternate hypotheses throughout.

CONCLUSION AND RECOMMENDATIONS

The descriptive and inferential analyses that were carried out on this topic showed that cooking gas is good for substitution for fuel wood for the sustainability of Nigeria forest.

The followings are therefore put forward as recommendations:

Federal Government of Nigeria should endeavour to stop forthwith the flaring of gas in the refineries and should therefore convert natural gas to cooking gas for Nigerians.

Government of Nigeria should try to connect households in Nigeria with cooking gas with affordable monthly charges like the electricity grids.

There should be outright ban on the use of fuel wood with a grievous penalty for whose ever that contravene such law(s).

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