ANALYSIS OF ACCESS TO CLEAN ENERGY AS A PRE-REQUISITE FOR IMPROVED LIVING CONDITIONS OF RURAL FARMERS IN IMO STATE, NIGERIA.

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Abstract

This paper examined how access to clean energy improved the living conditions of rural farmers. It described the socio-economic characteristics of the respondents; identified energy sources available in the study area; described the energy needs of the rural farmers and effects of access to their living conditions. Random sampling technique was used to select 210 registered farmers from the 38 extension blocks in the three agricultural zones of Imo state. A well structured questionnaire was used to elicit information from the farmers and descriptive statistics such as percentages, means, and frequency distribution presented in tables were used to analyze data collected. Results showed that 54.3% were males, with over 70% within the ages of 41-60 years. Majority (50%) were married, 57% had primary education, with a household size of more than 8 persons. Energy sources include fire wood, charcoal, saw-dust, kerosene and crop residue use. All the respondents (100%) needed energy for cooking, pumping water, grinding, milling, lightening and land preparation. It was discovered that access to energy reduced malnutrition with mean response of 3.50, increases agricultural productivity (x = 3.70), reduced respiratory problems, allows more time for children education and reduced outbreak of water-borne diseases, among other benefits. This was due to lack of access to modern energy services in rural areas, it was recommended that extension agents should make rural farmers aware of the availability and importance of rural energy services for farmers' use to improve their socio-economic status.

Key words: *Energy, rural farmers, poverty reduction, electricity*

1.0 Introduction

Energy is the mainstay of Nigeria's economic growth and development. It plays a significant role in the nation's international diplomacy and it serves as a tradable commodity for earning the national income, which is used to support government development programmes. It also serves as an input into the production of goods and services in the nation's industry, transport, agriculture, health and education sectors, as well as an instrument for politics, security and diplomacy(Sambo, 2009).

Poverty is regarded as one of the world's most fundamental burning issues, which needs to be addressed through socio-economic development. Poverty is conceptualized in material terms as not having access to adequate levels of food, water, clothing, shelter, sanitation, health care and education. This can be translated into people having insufficient income. A better life and an improved standard of living are fundamental aspirations. But for millions of people a better life means getting access to basic needs such as food, health services, housing and clean water. None of these basic needs can be provided without energy (Sambo, 2009).

Energy is one of the most essential inputs into sustaining people's livelihoods, at the most basic level it is a precondition of cooked food, boiled water and warmth. Lack of access to clean and affordable energy is considered a core dimension of poverty. It has been well known for a long time that poor people tend to use biomass as their energy carrier. In many areas, there are increasing biomass supply shortages, which add to women's burden whose responsibility is to collect fuel

Access to sustainable, modern, affordable and reliable energy services is a fundamental prerequisite for poverty reduction and sustainable human development. Energy services impact upon all aspects of people's lives and livelihoods – people without access are constrained to a life of poverty. Nigerians experience some of the worst forms of energy poverty in the world (Eleri, et al.,2012). Currently, 15.3 million households lack access to grid electricity; and for those connected

to the national grid, supply is erratic at best. Per capita electricity consumption has been less than 150KWh3 per annum. Rural areas suffer the most electricity deprivation (Eleri, et al., 2012). Energy deprivation in Nigeria goes beyond lack of access to electricity. An estimated 72% of Nigerians depend solely on wood as a source of fuel for cooking. Contrary to the expectations of the National Energy Policy of 2003, deepening poverty has forced a reversal in the transition to modern and efficient energy forms (Eleri, et al.,2012).

Energy, and in particular, oil and gas, has continued to contribute over 70% of Nigeria's Federal revenue. National developmental programmes, and security, depend largely on these revenue earnings. Energy, especially crude oil, has over the past five years contributed an average of about 25% to Nigeria's Gross Domestic Product (GDP), representing the highest contributor after crop production. The contribution of energy to GDP is expected to be higher when we take into account renewable energy utilization, which constitutes about 90% of the energy used by the rural population (NPC, 2002; Sambo,2009). It should be noted that Nigeria which is located between longitude 3o and 14o East of Greenwich and latitude 4^o and 14^o north of equator has above 160 million people and a total land area of 923,768 km2 (NPC, 2002; Sambo,2009).

Today, more Nigerians are climbing down the energy ladder – moving from electricity, gas and kerosene to fuel wood and other traditional biomass energy forms. The growing energy poverty in Nigeria is strongly linked to the broader increase in the population of the poor in the country. Today, access to sustainable energy is recognised as a key factor in sustainable poverty-oriented development. On the one hand, energy services such as cooking, heating, lighting and communication are central to improvement of social well-being. On the other hand, energy services used for production and transportation are indispensable to economic progress (InfoResource Services, 2006).

Two developments will influence the availability of and access to energy in the future: (1) Energy consumption is increasing markedly, despite improved energy efficiency, primarily in the industrialised countries. Careful estimates indicate that energy use will double in developing countries in the next 20 years. (2) The use of substitutes for fossil fuels is increasing, accelerated by rising oil prices. Renewable energy, particularly biofuels, is becoming increasingly important. Consequently, experts predict that today's petroleum based society will be transformed into a bioenergy-based society in this century. In rural Nigeria, there exist dearth of information on this topic especially in the South east zone of Nigeria and by extension in Imo State. This study would therefore add to knowledge and close the gap created by lack of data of reliable information. The study therefore seeks to describe the socioeconomic characteristics of the respondents; examines the energy sources available to the respondents; identify the energy needs of respondents and ascertain the effects of energy access on the living conditions of respondents.

2.0 Methodology

The study was carried out in Imo State of Nigeria. Imo State is located in the South-eastern zone of Nigeria and lies between latitude $4^0$45oN and 7^0 15 N and longitude 6^o 50E with land area of 5,530 km2. There are twenty seven (27) Local Government Areas in the State. The state has a Ministry of Agriculture that supervises Agricultural activities in the state under the state ADP (Agricultural Development Project). Imo State Agricultural Development Programme is structured into three (3) Agricultural Zones viz Okigwe, Orlu and Owerri. Okigwe and Orlu Agricultural Zones have 10 Extension Blocks each, while Owerri has 18 Extension Blocks. The population of the study consists of all registered farmers in the 38 Blocks that make the three agricultural zones. A list of all registered farmers in the zone was obtained from the ADP office in the zonal headquarters. The list has a total number of about 2100 farmers and 10% was selected which gives a total sample size of 210 farmers. Data collected from use of questionnaire were analyzed using descriptive statistics. This includes use of mean, percentages presented in frequency distribution table to achieve the objectives of the study, especially objectives 1 and 3. While objective 2 was achieved on a three point likert-type scale of easily available, available, and not available assigned weight of 3, 2 and 1. The weighted index were added to give 6 divided by 3 to give 2. Any value less than 2 was regarded as not available. Finally objective 4 was achieve on a

four point likert-type scale of strongly agree, agree, disagree and strongly disagree with a weighting scale of 4,3,2 and 1. The weighted index were added to give 10 divided by 4 to give 2.50. Any value less than 2.50 was not accepted while values of 2.5 and above was taken as positive.

3.0 Results and Discussions

3.1 Socioeconomic characteristics of respondents

Table 1 shows the socio-economic characteristics of the respondents. The table revealed that 54.3% of the respondents were males while 45.7% were females. This shows the dominance of the male (men) in farming as owners of land and family heads. On age, 31.4% were within the active farming age of 41-50 years, followed by 44.7% who were within the age range of 51-60 years. The mean age of respondents was 49.5 years. This agrees with Mgbada (2010) who posited that the mean age of present Nigerian farmer is between 45 and 50 years. These individuals are healthy as they were within the productive average age range of 56 years. Again, 50% were married, 37.1% are widows who fend for themselves and family. On education level of respondents, 57.2% attended primary school, 25.7% had secondary education, 14.3% had no formal education; with 2.8% attending tertiary education. According to Akubuilo (2008) farmers who have had formal education are more receptive to new ideas than those who are illiterates. Furthermore, majority (67.6%) have farm size between 0.5 to 1 hectare, 22.8% have 1.5-2 hectares of land. The mean farm size was 1.87 hectares. The majority (48.1%) have large family size of more than 9 members, 35.7% have 5-8 members. The mean family size was 7.8. This number helps in family labour for agricultural production. They readily supply family with labour needed to perform farm operation. Labour, which would have been supplied by machines are now done by human power. The respondents have been in farming for many years as indicated by 39.5% who have put in 21-30 years, 30.5% have also spent more than 30 years farming. The mean farming experience was 24.6 years

It was also discovered that 41.4% of the respondents have not received the visit of extension agents at all within one month, 30.5% received the visit of extension agent within two weeks, while 28.1% said they received once in a while. This visits should have given them information on access and availability of clean energy. Majority (82.8%) of the respondents belonged to social organizations where they learn from other members and get information. Supporting the above, Mgbada (2010) said a farmer who belongs to many social organization will tend to adopt innovations more than his counterpart who belongs to non. Social organizations provide for a where a wide range of topics are discussed.

Table 1: Socioeconomic Characteristics of Respondents

Attribute	Frequency	Percentage
Sex		
Male	114	54.3
Female	96	45.7
Age		
21-30	10	4.7
31-40	23	10.9
41-50	66	31.4
51-60	94	44.7
60 and above	17	8.1
Marital status		
Single	6	2.8
Married	105	50
Widow	78	37.1
Widower	21	10
Education level		
No formal Education	30	14.3
Primary	120	57.3

Secondary	54	25.7
Tertiary	6	2.8
Farm size		
0.5-1	142	67.5
1.5-2	48	22.8
2.5 & Above	20	9.5
Household size		
1-4	34	16.2
5-8	75	35.7
9 & above	101	48.1
Farming experience		
1-10	15	7.2
11-20	48	22.8
21-30	83	39.5
Above 30	64	30.5
Extension visit		
Not at all	87	41.4
2wks	64	30.5
Once a while	59	28.1
Membership of organization		
Yes	177	82.8
No	36	17.2

Source: Field survey, 2015

3.2 Energy sources available in the study area

Table 2 showed availability of energy sources in the study area. The table shows that the respondents have no easy access to hydro-power energy technology as indicated by zero mean response, solar energy (mean =1.75), electricity (mean =2.15), wind power (mean = 1.90) and biomass (mean= 2.45). The respondents indicated electricity with mean response of 2.15 is not always available due to common erratic power supply by the former National Electric Power Authority (NEPA), Power Holding Company of Nigeria and recently Enugu Electricity Distribution Company (EEDC). Again the commonest and major energy source of respondents is the use of fuel wood which has a very high mean of 3.70. This they do by going to the bush to cut down trees to use as firewood. Charcoal is another major energy source in Imo State. This has a mean response of 3.50. Lack of access to reliable, clean and affordable energy sources in rural areas significantly diminishes the opportunities for the development of many economically productive activities, for all enterprises. Renewable energy technologies are an important subset of the decentralized alternatives that are now commercially available and increasingly used in the agriculture and food sectors.

Table 2 Energy sources in the study area

Sources	Mean	Remark
Hydro power (water)	00	Not available
Biomass	2.45	Not available
Solar energy	1.75	Not available
Wind power	1.50	Not available
Wood	3.70	Available
Crop residue	2.50	Available
Saw Dust	2.51	Available
Charcoal	3.50	Available
Kerosene	2.70	Available
Electricity	2.10	Not available

Source: Field survey, 2015

In the study area, hard woods are cut down and burnt in air tight conditions to produce charcoal for use by almost every family for cooking and corn roasting. Kerosene use is another energy source of respondents in the study area. The respondents buy kerosene for use in the home or farm. This is purchased by almost every household in the study area in order to make fire and cook, or do other necessary household business. In rural areas, farmers, fishers and foresters often still rely on traditional fuels like wood, charcoal and dung, for cooking, heat and light. They generally burn these fuels using simple technologies characterised by low energy efficiency and harmful emissions. Human energy is used for household work (fetching water, washing clothes, gathering and preparing biomass for fuel), and human and animal power for agriculture, transportation and small-scale productive activities. When incomes rise and more convenient technologies become available, farmers tend to shift to modern energy carriers or more convenient energy-efficient equipment higher up on the energy ladder.

This finding means that wood, dung and other biomass fuel are the lowest rungs on the energy ladder and the respondents still using old or traditional energy that will not lead them anywhere. Charcoal, coal and kerosene represent higher steps, and electricity and LPG (Liquefied petroleum gas: commercial butane and propane) are at the top, while modern biofuels in liquid and solid form and other renewable energies such as solar and wind are expected to make a much larger contribution in the next decade. The findings agrees with Famuyide et at.,(2011) who posited that the predominant energy resources for domestic and commercial uses in Nigeria are fuel wood, charcoal, kerosene, cooking gas and electricity. Other sources, though less common, are sawdust, agricultural crop residues of corn stalk, cassava sticks, and, in extreme cases, cow dung. In Nigeria, among the urban dwellers, kerosene and gas are the major cooking fuels. The majority of the people rely on kerosene stoves for domestic cooking, while only a few use gas and electric cookers (Abiodun, 2003). The rural areas have little access to conventional energy such as electricity and petroleum products due to the absence of good road networks. Petroleum products such as kerosene and gasoline are purchased in the rural areas at prices very high in excess of their official pump prices.

The rural population, whose needs are often basic, therefore depends to a large extent on fuel wood as a major traditional source of fuel. It has been estimated that about 86% of rural households in Nigeria depend on fuel wood as their source of energy (Williams, 1998). A fuel wood supply/demand imbalance in some parts of the country is now a real threat to the energy security of the rural communities (Energy Commission of Nigeria). The result is in line with a report of the International Energy Agency (IEA), which states that sub-Saharan Africa has the lowest electrification rate of any major world region with only 23% of its population having access to electricity (IEA, 2002). Generally, more than 500 million Africans are still without access to electricity. Statistics show that more than 83% of the Africa‘s population living in rural areas has no access to electricity, while more than 92% of rural Sub- Saharan Africa‘ s population is still without access to electricity.

3.3 Energy needs of rural farmers

Table 3 shows the energy needs of the respondents in the study area, all the respondents (100%) indicated that energy is needed for cooking. This is most essential in human living as we all must eat food to be healthy and keep going. Other energy needs of farmers in the area includes pumping water (80.9%) lightening (illumination) with 97.6% response, grinding (71.4%), milling (47.6%), chying fo crop (94.3%), food produce storage (85.7%), smoking (71.4%), water heating (82.9%), land preparation (92.4%) and husking of grains (57.1%).

The implication of the above is that to grow and prepare food in sufficient quantities to avoid hunger and malnutrition, communities need pumped water not only for drinking but also for irrigation and livestock watering. They need to mill grains and store perishable foods as well as wash and cook without access to sufficient clean fuels for cooking, women will continue to be exposed more than any one to indoor air pollution. Again, craft industries in rural areas need energy for sawmills, spinning wheels and loons where they exist. Hospitals, rival clinics need power for refrigeration containing vaccines to care for medical needs of the rural sick. There are more than two billion people who are unable to obtain

clean, safe fuels and must rely on burning traditional biomass fuels such as wood, dung and crop residues (UNDP, 2000) Without access to efficient and affordable energy sources, they have very limited opportunities for economic and social advancement. Expanded energy sources are needed in rural areas to provide: mechanical power for agriculture, food processing, water pumping and irrigation; modern fuels for cooking and heating; and electricity for lighting, refrigeration, communications, commercial enterprises and community services. The regions most affected by the energy-poverty nexus are in Africa and Asia, especially areas in the Least Developed Countries where there is no access to grid-based electricity and where modern fuels are difficult to procure. Because they are very dependent on subsistence agriculture and environmental resources for their livelihoods, people in these regions are particularly vulnerable to the depletion of natural resources, and the impacts of climate change.

Table 3: Energy needs/activities of respondents

Energy needs	Frequency	Percentage
Cooking	210	100
Pumping water	170	80.9
Lighting (illumination)	205	97.6
Grinding	150	71.6
Milling	100	47.6
Husking	120	57.1
Drying of crops	198	94.3
Smoking	150	71.4
Preservation/storage	180	85.7
Communication (TV, radio)	164	78.1
Battery charging	95	46.7
Water heating	174	82.9
Land preparation	194	92.4

Source: Field survey, 2015

3.5 Effects of Access to Energy on Living Condition

Table 4 reveals that poverty alleviation and development depend on universal access to energy services that are affordable, reliable, clean and of good quality in order to reduce and eradicate poverty. With a very high mean response to the statement, energy availability has the capacity to impact on living conditions of rural farmers. The table reveals that access to clean energy reduces malnutrition and food crisis with mean response of 3.50. This happens when there is enough stock of food for the family and market. Availability of energy allows farmers to cultivate more land and harvest more, thereby having enough to eat and sell. Other effects of access to clean energy include increase agricultural productivity (yields) with mean of 3.70, reduced drudgery in agriculture (mean = 3.45) reduction of respiratory problems (mean = 3.65), reduced infant mortality (mean = 3.50), conservation of drugs for family use (mean = 2.70), lowering pollution improves vegetation cover (mean = 3.50), reduces time for wood collection (mean = 3.47), reduces the vulnerability of women to abuse (mean = 3.47), reduces the vulnerability of women (mean = 3.20) encourages new economic opportunities (mean = 2.75), increase income generation opportunities (mean = 3.47), reduces outbreak of water borne diseases (mean = 3.56), leads to higher literacy among women (mean = 2.58), frees children from wood collection (mean = 2.68), increase reading time of farm families (mean = 2.50), and creation of social ties (mean = 2.52).

Consequently, the role that energy services can play in helping to achieve the MDGs and improve the lives of the poor, as well as the direct and indirect energy-poverty links can be outlined as follows: 1) Access to energy services facilitates economic development, including micro-enterprise, increased productivity from use of machinery, income-generating and livelihood activities from extended lighting and improved local employment creation. 2) Access to clean and

efficient fuels reduce the large share of household income spent on cooking, lighting and space heating. 3) Access to modern energy services can also assist in bridging the ―digital divide‖ from ICT. 4). Energy services can also improve productivity throughout the food chain (tillage, planting, harvesting, processing, transport, etc.) and reduce post harvest losses through better preservation (for example, drying and smoking). 5) Energy for irrigation helps increase food production and access to nutrition. 6) Clean water helps improve health. 7) Increased health and nutrition open up opportunities for employment and income generation(William, 1998; Europa, 2007).

Table 4 Perceived Effects of Energy Access on Respondents Condition

Statement	Mean	Remark
Reduced malnutrition and food crisis	3.50	Strongly agree
Increased agricultural productivity (yield)	3.70	Strongly agree
Reduced drudgery in agriculture	3.45	Strongly agree
Reduction of respiratory problems	3.65	Strongly agree
Reduction of infant mortality	3.50	Strongly agree
Conservation of drugs for family use	2.70	Strongly agree
Lowering of pollution emission	3.30	Strongly agree
Decreasing of biomass consumption	2.70	Strongly agree
Improvement in vegetation cover	3.50	Strongly agree
Reduced time spent on wood collection	3.74	Strongly agree
Reduced women's vulnerability to abuse	3.50	Strongly agree
Increase work opportunity for women	3.20	Strongly agree
Encourage numerous economic activities	2.75	Strongly agree
Increase income generating opportunities	3.47	Strongly agree
Reduce outbreak of water born disease	3.56	Strongly agree
Leads to higher literacy among women	2.68	Strongly agree
Frees children from wood fuel collection	2.68	Strongly agree
Increase reading time of farm family	2.50	Strongly agree
Creation of social ties (night-time discussions)	2.52	Strongly agree

Source: Field survey, 2015

Conclusion

For people living in poverty, the most pressing priority is the satisfaction of basic human needs, which includes access to food, shelter, water supply and sanitation and other services that will improve their standard of living, such as healthcare, education and better transport. It is required as a crucial input for providing other essential human needs such as cooking, milling, grinding, among others.

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