



Use of Solar Energy as an Alternative Source of Energy in Zaria

Akut, Y. B.

Department of Geography,
Federal College of Education,
Zaria-Nigeria.

ABSTRACT

This study examines the uses and factors that determine the use of solar energy as alternative source of energy in Zaria. Data sets were obtained from 120 purposively selected respondents cross metropolitan Zaria. The data sets were subjected to both descriptive and inferential statistics. Correlation analysis was used to test the hypothesis. The results identified calculators, flash lights and water pumping machines as the major solar energy equipments commonly used. It also revealed that higher income earners constitute a majority of solar energy users. The correlation analysis shows a significant relationship between educational qualification, income and the choice of solar energy. It was concluded that the various renewable sources of energy now being developed are likely to remain too costly to have much influence on the household fuel-supplies of the country's rural and urban poor for a long time to come.

ARTICLE INFO

Article History

Received: January, 2020

Received in revised form: February, 2020

Accepted: March, 2020

Published online: April, 2020

KEYWORDS

Solar, Energy, Panels, Devices and Calculators

INTRODUCTION

Around the world, new energy technologies that do not rely on fossil fuels such as coal, petroleum, and natural gas are moving from the experimental stage to commercial reality. Sunlight, wind, and other renewable resources are increasingly converted into useful forms of energy with ever-greater efficiency. The new technologies still provide less than 1 percent of the world's energy supply, but they appear to be advancing rapidly.

The timing of these advances could be of critical importance to the future of modern civilization. Most experts believe that an energy system based on fossil fuels cannot be sustained for another century. According to several recent estimates based on currently known oil reserves, oil production will peak within the first 10 to 20 years of the 21st century.

Even if additional reserves are discovered, many scientists say that continued reliance on fossil fuels as a primary energy source over the coming decades could release into the atmosphere billions of metric tons of carbon dioxide and other heat-trapping gases. International efforts, including the December 1997 Kyoto Protocol, are already underway to cap emissions of these gases, which many scientists have linked to global warming (an increase in the earth's surface temperature). But the efforts of fossil fuel-dependent companies to thwart emissions caps may delay ratification and implementation of the protocol (Flavin and Dunn, 2009)

Many experts believe a transition toward renewable, carbon-free energy technologies would go a long way toward addressing the problems of dwindling oil reserves and the potentially ruinous



environmental impacts linked to the burning of fossil fuels.

Developed by scientists at Bell Laboratories in 1954, modern solar cells are generally made of crystalline silicon, a semimetallic element. Photovoltaic cells were first developed in the 1960s as a power source for orbiting spacecraft in the U.S. space program. They are now widely used as a power source for satellites, remote communications systems, traffic signs, and consumer electronic devices such as pocket calculators and watches. Advancing technology has driven production costs down by 80 percent in the past 20 years, and solar electricity is beginning to emerge as a potential competitor to fossil fuels. Solar energy is a renewable source of energy that is gaining ground because of the benefits it offers (Guta, 2018; Rahut, Mottaleb, Ali and Aryal 2018; 2019). This research attempts to assess people's perception of the various uses and the factors that determine the use of solar energy as an alternative source of energy in Zaria. The following objectives would help in achieving the aim of the research.

1. To identify the uses of solar energy by residents of Zaria
2. To identify the factors that determine the use of solar energy
3. To identify the problems associated with the use of solar energy

THE STUDY AREA

Zaria is located on latitude 11.6°N and longitude 7.44° E. It is found in the Northern Guinea Savannah at a distance of about 643km from the Sea. Zaria, city in northern Nigeria, in Kaduna State. A road and rail hub in a major agricultural area, the city is a market center for locally produced cotton, peanuts, hides and skins, shea nuts, corn, sorghum, and vegetables. Industries include cotton ginning, peanut and shea-nut

milling, tanning, cottonseed-oil production, and the manufacture of cigarettes, bicycles, perfumes, and soap. Zaria is an important center of education and research, with Ahmadu Bello University (1962) and affiliated institutions such as the Institute for Agricultural Research (1924), National Animal Production Research Institute (1924), and National Research Institute for Chemical Technology (1988) located here. It is also the site of the Nigerian Civil Aviation Training Center. Once called Zazzau, the community was founded in the 14th century as one of the seven original Hausa city-states. According to oral tradition, Zazzau rose to prominence in the early 15th century under the brilliant military leadership of Queen Amina, (Microsoft Encarta 2009) It is made up of two Local Governments- Zaria and Sabon-gari and has a population of about 1,018,815 (National Population Commission, 2006).

THEORETICAL FRAMEWORK.

Petroleum, natural gas, and hydroelectricity are Nigeria's major sources of commercial energy; they are slightly outpaced by the largely noncommercial consumption of fuelwood and charcoal. Despite major programs to extend electricity to homes, only a small portion of rural households are electrified. Demand for electricity outstrips supply, in part because of mismanagement in the government agency overseeing energy production. In the late 1990s periodic power outages cost Nigerian factories countless hours of operation. The major thermal electrical installations are at Igbin, Afam, and Sapele. Hydroelectricity is generated at Kainji Dam and in lesser quantities at Shiroro Gorge on the Kaduna River, at Jebba, and at several smaller sites. Only a small percentage of the country's potential hydroelectric capacity has been developed, (Stock, 2009)



Consequently, majority of urban and rural dwellers revert to wood fuel technology to meet their energy needs as electricity and petroleum products, especially kerosene and LPG are not only expensive to purchase but their supply is irregular and unpredictable, (Adegoke, 1992).

Ogbonna, (1997), writing in tandem, notes that under the new economic policy of deregulation and commercialization, the cost of electricity and petroleum products have escalated so much that the much talked about alternatives to wood fuel as a source of energy to the majority of Nigerians have become a mirage.

The envisaged alternatives are now beyond the reach of all but the affluent and

mainly urban minority as a result of the escalation of prices of all forms of energy. Also, the renewable alternative sources of energy are likely to remain too costly for the rural and urban poor (Akut, 2007).

METHODOLOGY

The survey drew a representative random sample of 120 respondents across three purposively selected residential areas in Zaria. These areas include the GRA, ABU Staff quarters and Zaria City. Also, hospitals and Primary Health Centres were surveyed. Both descriptive and inferential statistics were used in this study. To test the hypothesis the data was subjected to Correlation analysis at the 0.01 level of significance.

RESULTS AND DISCUSSION

The uses of solar energy

Table1: The various uses and types of solar energy gadgets used by respondents

Type of gadgets/ Uses	Number of respondents	Percentage
Cooking/ water heating	12	10
Room heating	11	9.2
Room lighting/ Refrigeration	23	19.2
Water pumping	28	23.3
Calculators/ flash lights	36	30
Telling time	10	8.3
Total	120	100

Source: field survey, 2019.

From table1, the most frequently used solar energy gadget by majority of the respondents is the calculator and flash lights(30%). It is also used for pumping

water (bore holes) (23.3%), room lighting and refrigeration of drugs (19.2), other uses include cooking, room heating and telling time.

Factors that determine the use of solar energy

Table 2: Educational attainment

	Education	
	Resp	%
NCE/ ND	10	8.5
Degree/ HND	45	37.5
Ph.D	65	54
Total	120	100

Source: field survey, 2019.

Corresponding author: Akut Y. B. ✉ yabqutt@yahoo.com ✉ Department of Geography, Federal College of Education, Zaria. © 2020. Faculty of Tech. Education, ATBU Bauchi. All rights reserved



Table 3: Sex of respondents

Male	Sex		Female
	%	%	
90	75		30
			25

Source: field survey, 2019.

Table 4: Income of respondents

₦	Income	
	Resp	%
50,000-70,000	15	12.5
80,000-100,000	20	16.6
110,000-130,000	25	20.8
150,000 and above	60	50
	120	100

Source: field survey, 2019.

Table 5: Age of respondents

Yrs	Age	
	Res	%
18-25	15	12.5
26-32	25	20.8
33-41	40	33
42 above	50	41.6

Source: field survey, 2019.

It could be seen from table 2 above that solar energy usage is limited but not exclusively to those with higher educational qualifications, most of whom are in possession of either the first degree/HND or Masters/ doctorate degrees. The usage of solar energy gadgets among NCE/ND holders is largely for calculators, telling time or flash lights. According to table 3, majority of the respondents using solar energy are males(75%), while females make up the remainder.

In terms of income, higher income earners (over ₦150,000) constitute majority

(50%) of the respondents (table 4) and they use such gadgets as water pumping machines to power boreholes and for room lightning also. The lower and middle income earners use it mainly to power calculators, wrist watches and flash lights.

In order to test the hypothesis that there is no significant relationship between educational attainment and the use of solar energy, the data was further subjected to correlation analysis. The result (.906) reveal a significant relationship between educational qualification and income which in turn influences the choice of solar energy as an alternative source of energy.

Problems Associated with the Use of Solar Energy

Table 3. Problems associated with solar energy usage

Problems	Respondents	%
Cost of installation	65	54
Weather	25	21
High voltage	30	25
Total	120	100

Source: field survey, 2009.



The table above is a reflection of the perception of the problems associated with the use of solar energy. Majority of the respondents (54%) identified cost of installation as the main problem, while the vagaries of the weather and high voltage output are the other problems mentioned. Long periods of cloudiness are thought to have some effects on solar output. Some of the respondents complained that their electrical appliances have been destroyed by the higher volts of solar energy.

CONCLUSION

The various renewable sources of energy now being developed are likely to remain too costly to have much influence on the household fuel-supplies of the country's rural and urban poor for a long time to come. This will lead to an increase in the exploitation of surrounding forests for fuelwood leading to deforestation with attendant environmental degradation.

RECOMMENDATIONS

1. There should be aggressive enlightenment campaigns to educate the public on the advantages of solar energy.
2. The spare parts for building solar energy technology should be made more affordable to the man in the street.

REFERENCES

Adegoke, S. O. (1992) "The Conventional Energy Resources of Nigeria" in Sereki, O. A. & A. O. Adegbulugbe (eds) *Energy Issues in Nigeria, Today and Tomorrow*. Conference Proceedings.

Akut, Y. B. (2007). The Economic implications of Household Energy Consumption in Jimeta. A Paper presented at the 49th Annual Conference of the Association of Nigerian Geographers held at the

Department of Geography,
University of Abuja, 15th-19th
October.

- Ali, A., Mottaleb, K. A. and Aryal, J. P. (2019). Wealth, education and cooking-fuel choices among rural households in Pakistan. *Energy Strategy Reviews*. Elsevier
- Ali, A., Mottaleb, K. A. and Aryal, J. P. (2019). Alternate energy sources for lighting among Rural Households in the Himalayan region of Pakistan: *Energy and Environment*. Sagepub.com.
- Federal Republic of Nigeria, Official Gazette (2007): The 23 Legal Notice on the publication of the Detailed breakdown of the National and State Provisional totals of the 2006 Census, Vol. 94 No. 24 Lagos. Fed. Govt. Printer
- Flavin, C. & Dunn, S. (2008) Will Renewable Energy Come of Age in the 21st Century? Microsoft Encarta 2009, Redmond WA: Microsoft Corp.
- Guta, D. D. (2018). Determinants of household adoption of solar energy technology in rural Ethiopia. *Journal of Cleaner Production*, Elsevier.
- Ogbonna, D. O. (1997) "The Nigerian Energy Subsidy Debate, Implications for Environmental Planning". In Daura, M.M.(ed) *Issues in Environmental Monitoring in Nigeria*. Journal of the Nigerian Geographical Association.
- Rahut, D.B., Mottaleb, K.A. Ali, A & Aryal, J. (2018). The use and determinants of solar energy by Sub-Saharan African households International Journal of ..., Taylor & Francis
- Stock, R. "Nigeria", Microsoft Encarta 2009, Redmond WA: Microsoft Corp. 2008. "Zaria." Microsoft® Encarta® 2009, Redmond, WA: Microsoft Corp. 2008.