ANALYSES OF BAKERIES AND TYPES OF ENERGY USED IN BAUCHI METROPOLIS.

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Abstract

The study assesses the consumption pattern of woodfuel among bakeries in Bauchi metropolis with a view to provide information for sustainable management of the environment. The data were obtained through both primary and secondary sources. Questionnaires was designed to get the pattern of different types of energy used by bakeries. One hundred copies of questionnaire were administered to the respondents of the bakeries identified. The totals of 40 bakeries were identified using snow-ball sampling method in Bauchi state, the rate of overdependence on woodfuel by owners of bakeries is a great concern. The findings show that Woodfuel and electricity were the main sources of energy used. Thirt eight (38) bakeries were using woodfuel while two (2) use electricity. This is due to availability and affordability of woodfuel (N55 per bundle) than electricity (N29.8 per unit). It was found that the high cost is the main factor militating against the use of electricity for baking bread and hot-wet and cold- wet are the period with highly demand of energy for heating the ovens due to the dampness of the environment and also, are the season of high cost of woodfuel because, accessibility is difficult. It was recommended that government and stakeholders should subsidies other alternative source of energy like solar energy in order to reduce over dependency on woodfuel which affect the quality of environment, also modern oven that have chimney or other

clean energy sources should be made available at subsidized rate, these may reduce the over dependency on forest resources as the only bank for woodfuel resources for the sustainability of the environment.

***Keywords**: Woodfuel Bakeries Consumption Energy Electricity*

Introduction

Developing countries depend on woodfuel and charcoal to supply most of their energy. The Wold Fact Book (WFB 2008) stated that clean 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 programs. 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.

With the level of poverty in the country owner of bakers cannot afford to procure these equipments which are expensive, especially now with economic realities compelling the Nigerian government to remove subsidies on petroleum products, thereby commercializing the petroleum industry. Obueh (2007) reported that the deregulation policy of Nigerian government on petroleum products has affected availability, use and consumption pattern of energy. The cost of petroleum escalated and made them out of reach of most bakeries owner of in the country. Therefore, this has made most owners of bakeries to make use of the cheapest sources of energy which are woodfuel and charcoal (Umaru 1999).

Sources of Energy

Energy sources are classified into two groups: (2.1.1) Renewable and (2.1.2) Non-renewable energy. Renewable energy is energy that can be replenished and include the following:-

Bio energy: Biomass can be converted directly into liquid fuels, called bio fuels. Because bio fuels are easy to transport and possess high energy density, they are favored to fuel vehicles and sometimes stationary power generation.

Hydropower: is the most mature and largest source of renewable energy.

Geothermal: Geothermal power plants access the underground steam or hot water from wells drilled a mile or more into the earth. The steam or hot water is piped up from the well to drive a conventional steam turbine, which powers an electric generator.

Solar Energy: Solar technologies tap directly into the infinite power of the sun and use that energy to produce heat, light, and power.

Wind Energy: Wind turbine technology may look simple: the wind spins turbine blades around a central hub; the hub is connected to a shaft, which powers a generator to make electricity. However, turbines are highly sophisticated power systems that capture the wind's energy by means of new blade designs or airfoils. Modern mechanical drive systems, combined with advanced generators, convert that energy into electricity.

Non-renewable energy: are essentially fossil fuel like petroleum oil, gas, nuclear and coal. According to Enger and Smith, (2004), the formation of fossil fuel takes millions of years and is finite in availability; they are formed as a result of accumulation of energy rich organic molecules produced by organism as a result of photosynthesis. Up to the 1960's, coal production was significant and dominated commercial energy supply. In 1990, coal share in total commercial energy consumption was less than one percent (Garba, 1999).

Five types of energy sources investigated (diesel, petrol, kerosene, wood and solar) by Sambo (1991) Show that woodfuel accounted for 95.8% while kerosene was 4.2%.

Wang, (2009) Observed that Energy derived from fossil fuels (oil, coal, and natural gas) has come to play a very central role in the U.S. economy and in American lifestyles, not to mention in the production, processing, and distribution of food. Most of what is currently known about energy use in the U.S. food system is a direct result of the "energy crisis" of the early 1970s.

Mead, (2005) claimed that fuelwood harvesting in developing countries is so important that it rivals other sources of industrial energy such as electricity, principally among poor people in rural areas. Salim and Ullsten, (1999) repotted that 58% of the energy supply in Africa comes from woodfuel and charcoal and this percentage in Latin America and Asia, though lower, is 15% and 11% respectively, and thus cannot be neglected as a potential source of ecosystem disturbance.

Developed nations rely on electricity, gas and solar energy for meeting their domestic energy needs. Serious intensification of technological advancement effort has led to the identification, exploitation and utilization of other energy sources in most of the technologically advanced countries. As a result, various energy sources such as nuclear, wind, solar among others are developed and utilized for the generation of energy. Globally, more than 2 billion people depend on woodfuel for meeting their energy needs (Adetunji *et al.*, 2007).
There are diverse technical, environmental, social, cultural and economic reasons for choosing woodfuel as a source of energy. For many users the choice depends on the availability and affordability of other energy options. These factors make woodfuel use a site- and situation-specific energy option (Horgan, 2001). In the past, wood harvesting in developing countries was mainly for domestic consumption, and it was mostly women who gather the dried branches and trunks of trees and shrubs for woodfuel (Awah, 1995). Today, the situation has changed, as increased commercialization of the sector has led to the widespread harvest of both dead and live branches and trunks by men and women (Awah, 1995). Woodfuel is harvested, processed, marketed and consumed exclusively by forest dependent communities, moving from collectors through wholesalers and retailers to consumers. Woodfuel is forest product with little sophistication in length of processing and marketing, the products reach the final consumers more or less directly (Malimbwi and Mugasha, 2001)
The woodfuel sector employs many men, women, and children in both rural and urban areas, offering both temporary and permanent employment opportunities. It is important economically because it offers an immediate source of income to the exploiters (Larinde and Kehinde, 2003).

Energy used in the Urban and Rural Areas

In the opinion of Ubueh, (2007) forests contribute directly and indirectly to rural household livelihoods through the generation of income and employment from the sale and exchange of gathered and unprocessed non-timber forest products such as woodfuel. Kerosene and gas are not readily available due to inadequate supply in most Nigerian rural areas. Studies have shown that in Nigeria, harvesting of woodfuel contributes to deforestation at a rate of about 400,000

hectares per year. If this trend continues, the country's forest resources could be completely depleted by 2020 (Alli *et al.*, 2001 and Obueh, 2007).

Babanyara *et al.*, (2010) in their work Urbanization and the Choice of Woodfuel as a Source of Energy in Nigeria found out that the factors causing woodfuel demand in urban areas include, Rural-urban migration, Urbanization, Poverty, Hikes in prices of kerosene and cooking gas amongst others. Lawrence (1998) reported in her work ''Socio-economic Analysis of Woodfuel Production and Utilization in Communities'' found that the raw materials for the processing and production of woodfuel found in almost all the five (5) communities selected for the study came from the natural forest People do not plant their own wood (trees) to use them as fuel for either domestic and/or commercial purposes.

Falola, (1998) in his work investigated woodfuel consumption in urban Kano, the rural urban trade in firewood, the ecology of wood fuel, and the management of wood resources in the hinterland. Reported that several factors account for the preservation of trees in Areas close to the urban centre. First, rising prices of firewood, together with subsidized petrol costs have made the increased distance acceptable to merchants. Second, resistance to wood cutting by the local farmers has stabilized off take within the local hinterland. The rural dwellers, whose needs are often basic, depend to a large extent on the traditional sources of energy for their domestic energy requirements, while the majority of the urban dwellers depend on traditional energy sources and fossil fuels. However, the high level of poverty and other socio-economic problems inhibit both the rural and urban dwellers from having access to adequate and reliable sources of energy for domestic purposes.

In terms of energy availability, there are various ample energy sources in Nigeria such as wind, solar, hydro, coal, oil and gas etc, which if properly managed will alleviate energy problems of the people most especially for domestic consumption. Obviously, Nigeria is naturally endowed with oil and gas and depends on it for her economic development. For example, oil accounts for 80.5 per cent of national revenue. These two energy sources are the major export commodities that provide foreign exchange for the country. Oil and gas also play major role in meeting energy needs of the various sectors of the nation's economy. For example, gas, petrol, diesel and kerosene provide energy for wide industrial and domestic application (CBN, 2007). The use of woodfuel has been on the increase due to increase in cost and scarcity of alternative sources, particularly Kerosene (Paul, 2008).

Material and Methods

Introduction

The methodology adopted for this research such as research design, sources of data, sampling techniques, data collection techniques, and data analysis and presentation were presented in this chapter.

Sources of Data

The data were obtained through both primary and secondary sources. The primary sources are the data generated from questionnaire and Global Position System (GPS), while secondary sources data was collected from review of relevant literature such as books, and journals.

Research Design

The research design adopted is field surveys, where information on the type of energy used, factors influencing the energy choice, cost of alternative energy and consumption pattern of woodfuel among bakeries were derived using questionnaire and GPS was used for taking the coordinate of the bakeries.

Sampling Techniques

Forty (40) bakeries were identified using snow-balling sampling method. This is because the precise location of the bakeries is unknown. In each bakery identified, the respondent directed the researcher to the next bakery. Questionnaire was administered to the respondent in each bakery.

Data Collection Techniques

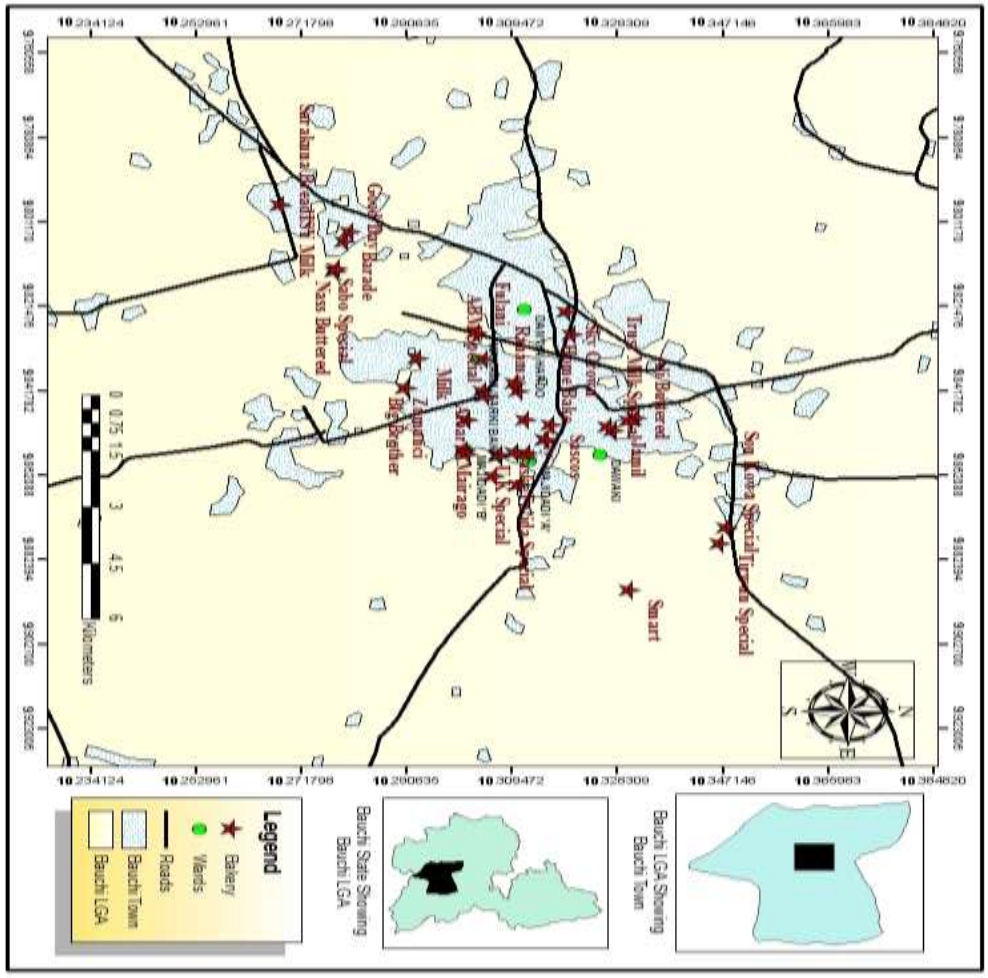
The questionnaire was administered to the identified respondents. The coordinate of each bakeries identified was recoded using Global Position System (GPS) in order to determine the spatial distribution of bakeries in the area.

Data Analysis and Presentation

The data obtained from the questionnaire was analysed using descriptive statistics of frequency, Percentage (%) and mean while the result was displayed Tabular forms.

Results

Spatial Distribution of Bakeries



The distribution of bakeries in Bauchi metropolis identified was mapped out as presented in figure 2.

Source: Fieldwork Survey Cartography Lab. Department of Geography BUK (2018)

Figure 2: shows that, Bauchi metropolis bakeries were located around Railway area while, others are located aroung Kobi, Sabuwar-Kasuwa, wunti, Kofar Idi, Central Market and Babangida square. Best of the spatial distribution of the bakeries presented in (figure2) indicates that north-eastern part of the metropolis have higher concentration of bakeries which may probably be attributed to high population around the area and the area is also closed to the railline station where business activities are dominated.

Types of Energy Sources Used

The types of energy sources used in bakeries activities in Bauchi metropolis were identified as woodfuel and electricity. Woodfuel is the major energy used in bakeries.

Table 1 Types of Energy Sources Used

Types of energy	Number of bakeries	Percentage (%)
Woodfuel	38	95.00
Electricity	2	05.00
Total	40	100%

Source: Field Survey (2018)

Table 1 indicated that out of forty bakeries, thirty-eight (95.00%) used woodfuel while only two (05.00%) used electricity. This implies that woodfuel are the major sources of energy for bakery activities, this is probably attributed the availability and affordability of the woodfuel in the area. This is supported by Sepp (1999) who reported that low patronage of electricity is probably due to high cost and inadequate of electricity.

Factors Influencing Energy Choice for Bakeries production

The factors influencing energy choices were identifying as cheap, availability, accessible, better test, less risk, normally used to it, efficient are presented in Table 2

Table 2 Factors Influencing Energy Choice for Bakeries Production

Factors	Type of energy	Woodfuel	Electricity
Cheap		57.50%	00.00%
Availability		17.00%	12.00%
Accessibilty		2.00%	77.50%
Better test		0.00%	08.00%
Normally used to it		19.50%	00.00%
Efficient		4.00%	02.50%
Total		100%	100%

Source: Field Survey (2018)

From Table 2 It is seen that 57.50% preferred to use woodfuel as a source of energy for baking because it is cheaper. Average bundle of woodfuel which weigh about 3.30 kg, with 6 pieces cost about N55. On other hand, 77.50% bakeries that use electricity as the source of energy for baking of bread prefer it due to their location close to the blue line (accessibility), because they made an agreement with the power staff and were connected to the relatively stable blue line (a 33kv electricity line which is meant for industries in the state), thereby having a near constant power supply. This agrees with the work of Sepp (1999) who noted that cheapness, availability of different energy sources, different energy user's habits, available technology, energy price in relation to the household and commercial mean income, will determine the consumption pattern. From the result, bakeries that use woodfuel preferred it due to its cheapness; the reason is that Bauchi state span two distinctive vegetation zone: guinea and sudan savannahs where there exist trees, therefore woodfuel is available and cheaper compared with other sources of energy while electric bakeries preferred best on the accessibility with blue line.

Factors Militating Against the Use of Alternative Energy Sources

The factors militating against the use of alternative energy were identify as high cost of energy, unavailability, and low income are presented in Table 3

Table 3 Factors Militating Against the Use of Alternative Energy Sources

Reasons	Frequency	Percentage (%)
High cost of energy	32	84.22
Unavailability	01	2.63
Low income	05	13.15
Total	38	100%

Source: Field Survey (2017)

From Table 3, the result shows that, (84.22%) of the woodfuel bakeries were unable to switch to other source of energy due to its high cost, 13.15% cannot afford the other source of energy due to their low income while, 2.63% due to unavailability and insufficiency. In regard to this result, Paul, (2008) reported that the use of woodfuel has been on the increase due to increase in cost and scarcity of alternative source. Also sepp, (1999) reported that energy price in

relation to the household and commercial mean income, will determine the consumption pattern.

Average Cost of Woodfuel (kg) and Electricity Unit (kwh)

The cost of woodfuel and electricity which are the only source of energy used for baking bread in Bauchi metropolis was presented in Table 4

Table 4 Average Cost of Woodfuel (kg) and Electricity Unit (kwh)

Energy Type	Unit of Measure	Average Cost (|N)
Woodfuel	Bundle (kg)	55.00
Electricity	Unit (kwh)	29.80

Source: Field Survey (2018)

Table 4 presented that the average cost of a bundle of woodfuel wich weigh about 3.30kg with 6 pieces' cost (N55.00) is much less compared with the average cost of a unit (kwh) of electricity (29.80N). Based on the result, one bundle of woodfuel is equal to 2 unit (kwh) of electricity interms of price. In regard to this result, Paul, (2008) reported that the use of woodfuel has been on the increase due to increase in cost and scarcity of alternative source. Similarly Adedayo (2005) repotted that the over dependence on woodfuel for energy is cheaper because of its relative low price and ease of accessibility.

Temporal Analysis of Energy

The temporal energy consumption is: hot-wet, hot-dry, cold-dry and cold-wet and were presented in Table 5

Table 5 Temporal Analysis of Seasons

Temporal Analysis of Seasons (%)	Frequency	Percentage
Hot-wet	17	42.50
Hot-dry	02	05.00
Cold-dry	06	15.00
Cold-wet	15	37.50
Total	40	100.00%

Source: Field Survey (2018)

Table 5 based on the data collected from the field, the result shows that, 42.50% energy is consumed during the hot-wet season, followed by cold-wet 37.50, the consumption of bread is higher at theses period due to cold and a lot of woodfuel is needed for production and for heating the oven due to dampness of the environment. While during the hot-dry and cold-dry only 20.00% energy are consumed, the temperature is higher and there is market for bread but not much as during hot-wet and cold-wet seasons. You can see that season is the main factor that determining energy consumption pattern, also within the season there are factors that determining energy consumption changes such as: Market flow of bake, Market day of neighboring village, working of other bakeries,

Average Cost of nergy Used For Baking

The average cost of energy (woodfuel and electricity) Were presented in Table 6

Table 6 Average Cost of Energy Used For Baking

Frequency	Woodfuel N	Electricity N
Daily	1650	2682
Weekly	11550	18774
Monthly	346500	563220
Yearly	4158000	6758640

Source: Author's Field Survey March (2018)

Table 6 revealed that the cost of electricity use for baking is found to be higher than woodfuel, this is probably the reason most of the respondents prepared to use woodfuel because of its less price and availability compared to other energy source. Horgan, (2001) reported that for many users, the choice depends on the availability and affordability. Similarly, with the level of poverty in the country bakeries owners cannot afford to procure these equipments which are expensive, especially now with economic realities compelling the Nigerian government to remove subsidies on energy products, thereby commercializing the energy industry. Obueh, (2007) reported that the deregulation policy of Nigerian government on energy products has affected availability, use and consumption pattern of it. The cost of energy escalated and made them out of

reach of most bakeries owner in the country. Therefore, this has made most owners of bakeries to make use of the cheapest sources of energy which are woodfuel and charcoal (Umaru 1999).

The bakeries in Bauchi metropolis are sparsely distibuted in the area and depend wholy on woodfuel for energy due to its cheapness and availabilty and high cost of other alternative is the factor militating against the use of other energy around the area. The consumption pattern of woodfuel is seasonal because of the demand of the bakeries products depend also on the season of the year. It was concluded that the small scale bakeries dominated (57.50%) among the metropolis bakeries.

RECOMMENDATIONS

Based on the findings, the following recommendations were suggested in the area.

1- Government should provide a bar land for bakers to plant trees before they finish cutting one side another side has grown. This will maintain the ecology of the environment.
2- Government should also subsidies the electricity price for bakeries to reduce over dependency on woodfuel.
3- Government and stakeholders should provide modern facilities in affordable price or loan through corporative to harness other alternative energy such as solar energy in order to reduce the over dependency on woodfuel which reduces the quality of environment.
4- The stakeholders should establish or construct more bakeries particularly around Wunti, Central market, new and old GRA and Babangida square because of the availability of electricity in the area, therefore, electricity can be used to reduce the pressure on woodfuel as a source of energy to bakeries located around the area.
5- Where falling of trees is necessary use of axe should be adopted because it enables the pad lopped to regenerate naturally but machine should be avoided because pad lopped die completely.
6- Policy should be enacted on the use of environmental friendly oven design (with chimney) and compliance should be monitored by the government. Therefore, the chimney will reduce the carbon emission to

atmosphere and the carbon be used as a raw-materials for carbon paper and ink.

7- Public awareness should be given to bakers about the implication of massive deforestation and the emission of carbon in to the atmosphere.

REFERENCES

Adentuji, M.O., Adesiyan I.O., Sanusi W.A.,(2007) *House hold energy consumption pattern*, in Oshogbo Local Government Area of Osun State, Pakistan Journal of Social Sciences 2007, 4(1), p. 9–13.

Alli, S., Sambo A.S.,and Asere, A.A.,(2001). *Household Energy Consumption around Bauchi Metropolis and Environs*, Nigerian Journal of Tropical Engineering, 2001, 2(1), p 37-48...

Awah, S. B. (1995). The rural woman and the importance of fuelwood in household energy nconsumption in the Diamaré division of the Far North Province. Student end of course memoir. National Institute of Rural Development. Dschang, University Center of the Inter-Ministerial Committee on Combating Deforestation and Desertification.

Babanyara, Y.Y and Saleh, U.F. (2010). Urbanisation and the choice of fuel wood as a Source bof Energy in Nigeria *Journal of Human Ecology*, 31(1) 19-26

Central Bank of Nigeria (CBN, 2007). Annual Report and Statement of Accounts.

Enger, E.A . and smith, B.F. (2004) environmental science- A study of interrelationship. McGraw hill, New York. *Environment*, CA 91731, U.S.A. 2(3): 87-92.

Falola, J.A. (1998). Wood fuel in Kano, Nigeria: The urban rural conflict

Garba, B. (1999). Overview of energy use. Program and manual for the training workshop on renewable energy system. Usmanu Danfodio University Sokoto.

Horgan, G.P. (2001). Wood energy economics. IIED, Gate Keepers Series no SA18 London

Larinde,S.L. and Kehinde.A.L (2003). "Gender determinant of farm income by rural dwellers incommunities around depleted Onigambari Forest Reserve in Oyo State, Nigeria". Proc. 11thAnnual Conf. Environment and Behavioural Association, pp 369-374.

Laurence Williams. F, (1998) Reflection on the tropical Deforestation Crisis iological Conservation, vol.91

Malimbwi R.E, and mugasha A.G. (2001). Inventory report of kitulangalo forest reserve, Morogoro, Tanzania Forest and beekeeping division Dar er salaam43pp

Mead D.J. (2005). forest for energy and the role of planted trees. Crit.rev plant sci.24 407-421

Obueh J. (2007). *Using a house hold energy technology to promote small- scale enterprises in rural communities in Nigeria*, HEDON Conference on Household Energy Network, p. 12–17.

Paul J (2008). Comparative Analysis of household Energy use in Yola Metropolitan Area. An unpublished M.Sc Thesis Department of Agricultural Economics and Extension, Federal University of Technology, Yola Adamawa state Nigeria.

Salim E, and ullsten O. (1999). Our fores our future: report of world commission on forest and sustainable development. Cambridge university press, Cambridge uk.

The World Fact book - CIA.(2008). Retrieved from https://www.cia.gov/library/ publications/the world-factbook/rankorder/ 2042rank.html

Umaru S. A. (1999). Consumption f Woodfuel In Bakeries In Jos Metropolis Of Jos North L.G.A. Plateau State. Being A Master's Thesis at Geography Department. University of Jos, Plateau Stste

Wang, L. J. (2009). Energy efficiency and management in food processing facilities. CRC Press Taylor & Francis Group, LLC, Boca Raton, FL, USA.