A SURVEY ON THE SOURCES AND USES OF DIFFERENT ENERGY TYPES IN BORNO STATE, NIGERIA.

BY

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(M.TECH/SSSE/2005/1379)

DEPARTMENT OF GEOGRAPHY

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

APRIL, 2010

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A THESIS SUBMITTED TO THE POSTGRADUATE SCHOOL, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF TECHNOLOGY (M.TECH) IN GEOGRAPHY (ENVIRONMENTAL MANAGEMENT)

APRIL, 2010

DECLARATION

I IBRAHIM, DANJUMA hereby declare that the Thesis title: A Survey on the Sources and Uses of Different Energy Types in Borno State, Nigeria is a product of my own research work under the supervision of Dr Okhimamhe, A.A.

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CERTIFICATION

This thesis titled: A Survey on the Sources and Uses of Different Energy Types in Borno State, Nigeria by Ibrahim, Danjuma (M.Tech/SSSE/2005/1379) meets the regulations governing the award of the Degree of Master of Technology (M.Tech) of the Federal University of Technology, Minna and is approved for its contribution to Scientific Knowlegde and Literary presentation.

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ACKNOWLEDGEMENTS

The Almighty God in His infinite Grace and Mercy is highly acknowledgement in my life without which the essence of existence is meaningless. This research project would not have been completed without the assistance of my great lecturers like Dr A.S. Abubakar, Prof. J.M. Baba, Prof. G.N. Nsofor, Dr M.T. Usman, Dr. P.S. Akinyeye, Dr H.A. Saba, Dr A.A. Okhimamhe, Mr B.M. Mansur, Mr S. Saidu and all the entire staff in both Geography and Geology Departments. My wonderful friends and colleagues at FUT Minna M.Tech Programme 2005/2006. Worthy to be mentioned are my relations, friends and colleagues in Abuja who have contributed positively to the success of this project both in cash and kind. Worthy to be isolated and recognize is my great able Project Supervisor Dr A.A. Okhimamhe who paid close attention to details and maintained high quality standard. I am grateful for her patience, confidence in the project and shepherdingit to completion.

ABSTRACT

This research work among other things was aimed at assessing the rural communities' attitude towards the use of fuelwood in Borno State, Nigeria. While one of the objectives is to create environmental awareness of issues locally around. The research design drew up for this project revealed at a glance the types of data collected namely, Primary data and Secondary data thus analysis thereafter. Questionnaire, Interviews and Published materials from the bulk of sources of data used. A survey of communities showed that 86 per cent of households depend on fuelwood for cooking, heating dwellings and other domestic activities. Furthermore, findings show that fuelwood collection forms part of the secondary causes of deforestation which have adverse effect on biodiversity and climate charge. Some mitigation process such as environmental awareness campaign through jingles in local languages by electronic and print media houses can help. Decision makers in developing countries must understand the causes and consequences of mismanagement of the environment which can have an impact on sustainable development. It is only through an informed pubic and informed leadership, only the political will can be found to make the tough policy decision required.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Biomass fuels comprising wood, agricultural wastes, animal wastes and other derived fuels are the major sources of traditional energy in developing countries often accounting for more than 75 per cent of the domestic energy consumption (Jan and Reddy, 2003). Biomass dependence is the highest in Sub-Saharan Africa, mostly consumed as domestic energy. The proportion of population dependent on biomass energy for cooking and heating of dwelling places is particularly high in most African countries with nearly all households using fuelwood for cooking in rural areas and charcoal in over 90 per cent of urban households as stated by Cunningham and Cunningham (2004). The dependence on biomass is low in Eastern Europe and Central Asia while it is significantly high in Africa (Jan and Reddy, 2003). In East Africa for example, biomass use account for 55 percent in cooking, 20 percent in water heating, 15 percent in space heating and 10 percent in other uses (WEC,2001).

Table 1.1 **REGIONAL TRENDS IN BIOMASS ENERGY DEPENDENCE**

	1995			2020			Annual growth rate 1995-2020	
Source	Biomass	Total	%	Biomass	Total	%	Biomass	Total
East Asia	106	422	25	118	931	13	0.4	3.2
South Asia	235	423	56	276	799	35	0.6	2.6
Latin America	73	416	18	81	787	10	0.4	2.6
Africa	205	341	60	371	631	59	2.4	2.5
World	930	6643	14	1143	10558	11	1.0	1.9

Source: D'Apote, 2000.

Firewood accounts for 50 per cent of all the wood cut in the world and satisfies most of the developing world's energy needs (Cunningham and Cunningham, 2004). Even with fuel substitution it is not expected that this dependence will change significantly before the end of the next century. Worldwide, nearly 3,000 million people use firewood as their principle source of energy. Fuelwood is collected mostly by unregulated commons, these commons give little or no attention to the danger of excessive exploitation carried out, through fuelwood extraction and as a consequence is sensitive to overexploitation as the population increases (Roper, 1995).

Table: 1.2 **THE POTENTIAL FOR THE USE OF BIOMASS**

Region	Population (10^6)	Total land area 10^6 ha	Croplands forests pasture 10^6 ha	Energy content of residue 10^6 GJ	Total energy consumption 10^6 GJ	Area to supply 35GJ/Cap
North America	276	1839	968	12	93	580
Europe	497	473	283	9	66	470
Asia	2,780	2,637	1,662	30.9	57.6	1,091
Africa	590	2,937	1,641	10.2	12.1	207
Central America	143	265	198	3.3	6.0	45
South America	279	1,751	1,541	11.6	10.8	53
World	4,990	13,056	8,727	86.5	326	1,751

[1] Biomass productivity taken as 10t/ha and, the area is that needed to supply the actual energy demand.

Adapted from D Hall, 1991.

The high demand for locally available source of energy in the form of fuelwood and charcoal is common in all parts of Nigeria. These environmental problems have been the cause of damage to vegetation (trees) and remain a serious threat to the trees in the Nation. The magnitude of this and other ecological problems has at various times caused the Federal, State and Local Governments to take some steps to combat them and the resulting dilapidated effects of the problems. Some of these efforts include establishment of the Federal Environmental Protection Agency (FEPA) by Decree No. 58 of 1988 and amended by Decree No. 59 of 1992, States Environmental Protection Agencies (SEPA) and Local Environmental Protection Unit.

Deforestation is a primary cause of desertification here in Nigeria, thus the use of fuelwood as source of energy easily accelerate the process of desertification. It is essential therefore to limit the extent of deforestation and to replant trees, but such projects are impossible without the support of local communities, to know the economic and environmental value of trees of which many are often unaware. The government's annual reforestation programmes have largely failed due to neglect by the authority concern, in the absence of sustained public awareness campaigns, thus majority of the saplings die or are cut down for fuelwood. The Nigerian government launch a National Action Plan Against Desertification in 2001, there has been no tangible improvement as the proposed 1,500km green belt along the edge of the desert promised in 2001 has not materialized. A report issued by the Federal Ministry of Environment shows that only 30,000 hectares were reforested in 2002, a mere tenth of the area claimed by the desert during the course of the year as stated in an article titled 'The Fragile Environment of Man' of Saturday Tribune (2007). Dauda (2006) states that Niger State forested/woodland cover averaged 60 percent just two decade ago, 40 percent ten years ago and 30 percent two years ago. At this rate, it is plausible to say that there may not be any woodland cover left in the State by 2020 due to excessive fuelwood collection and timber harvesting which causes deforestation easily.

In Nigeria a large percentage of its population depends on fuelwood as its primary fuel source of energy for cooking, heating dwelling and other domestic activities. Fuelwood use is most prominent in rural and urban areas, there is a significant minority of urban residents who depend on wood for their cooking fuel. In a poor populous country like Nigeria, fuelwood harvest is a major way that human being modify the environment, fuelwood cutting can induce environmental degradation. An estimated 70 percent of Nigerians who live in the rural areas depends almost entirely on fuelwood and other biomass energy forms to meet their residential energy demand and many of those consumption figures hardly enter into National Statistics (NEC, 2006).

Table. 1.3 **NIGERIA'S ENERGY RESERVES/POTENTIALS (2005)**

Resource type	Reserves
Crude Oil	36.0 Billion barrels
Natural Gas	166 Trillion SCF (2)
Coal and Lignite	2.7 Billion Tonnes
Hydropower, Large Scale	10,000 MW
Hydropower, Small Scale	734 MW
Fuelwood	13,071,464 Hectares (3)

(2) SCF Standard Cubic Feet; (3) Forest Land Estimate for 1981

Source: Nigeria's Renewable Energy Master Plan (2006).

People in developing countries are burning large quantities of fuelwood to cook their food and to heat dwelling places etc. Thus, in the poorest regions where no other employment is available, the rural population turns to wood cutting and charcoal production which leads to deforestation. This deforestation forces families to spend more time seeking firewood for domestic use. For example, in West Africa firewood and charcoal are the main sources of energy for domestic purpose. The most important tree species that are particularly useful due to their heating efficiency are *Vitex Doniaria, Prosipis Africana, Bombax Costatum, Borasscus Asthiopium* etc. As population increases, more energy is needed for domestic purposes such as cooking food, baking bread, heating dwellings etc. The bulk of this energy is derived from the fuelwood.

Although the level of industrial development of a country is no doubt a measure of its socio-economic development and strength in the emerging political order, there is no doubt that the drive to bring about drastic alterations of the environment. It is common feature to see heaps of logs of trees cut to sizes and shapes packed along highways or roads, some for commercial purposes while others for domestic use both as a source of energy to be used. These activities that result in cutting down of trees as a source of energy have drastic effect on vegetation cover in fragile ecosystems, which sustains the life support systems that have made this planet earth habitable for man over the years. The problems generated by

man's activities include the various forms of environmental degradation through the destruction of the vegetation in different forms. The destruction when not professionally handle can give rise to deterioration of the biosphere as it is currently expressed through vegetation damage, death of plants and animals, forest decline, change in ecosystem, species richness reduction through ecological damage.

1.2 STATEMENT OF THE PROBLEM

More than half of the people in the world depend on firewood or charcoal as their principal source of heating and cooking fuel. Consequently, fuelwood accounts for slightly more than half of all wood harvested worldwide.

An observation shows that the level of deforestation in Borno State ranges from moderate to severe as one move northward. The symptoms of deforestation can clearly be seen as a result of firewood collection and timber harvesting which is the secondary cause of deforestation. Firewood is collected mostly from unregulated commons and as a consequence, is very sensitive to over-exploitation as the population increases. Findings from the field survey shows that, the number of tree cut down outstrips the number of trees planted with a significant difference. In Borno State the use of fuelwood for cooking and warmth is widespread both in rural and urban centres. The logging of firewood for economic activity is on the

increase thereby impeding on the afforestation programme of the government. Plate I clearly show one of the several collection points of fuelwood extracted from the bush, most likely from one of the government afforestation programme site.

Plate I. One collection point of fuelwood extracted from the bush.
Source: Field Survey, October 2007

The environmental damage caused by man's activities such as continuous harvesting of trees to be used as fuelwood which were once acceptable could no longer be tolerated. Vegetation (trees) in such areas tends to be affected as the ecosystem on which we depend on for most of our food has been tempered with. Destroying various forms (species) of plant and animal life through destruction of habitat to the point where some species no longer exist (extinction). The indiscriminate cutting of trees to be used as fuelwood can affect the local environs vegetation but with global effects too, this is made possible through environmental degradation process such

as deforestation, desertification and soil erosion etc. Biomass burning, in the form of Savanna fires and firewood for cooking and warmth is widespread during the Harmattan periods in Nigeria. Thus, the extraction and utilization during such period is always high in volume and that aggravates the problem of deforestation.

1.3 AIM AND OBJECTIVES

The aim of this project is to study rural-communities attitude towards the use of fuelwood in Borno State, Nigeria. Below are some of the objectives

1. Create Environmental Awareness.
2. Assess the Environmental Awareness Policy if any
3. Involve Stakeholders/Communities in government policy formulation process.
4. Raise Awareness of Environmental Issues locally but with Global Impact.

From the problem stated above the following Hypothesis would be tested.

H_o – Environmental concern and management approaches do not form part of rural communities concern.

H_1 - Environmental concern and management approaches do form a part of rural communities concern.

1.4 JUSTIFICATION

In view of the high level of unemployment among people in Nigeria the physical identification of the availability of trees in the bush gives an

opportunity to people to engage in large scale commercial fuelwood business, thereby gaining full occupation in the destruction of the trees as indicated in Plate II.

Plate II. A retailer selling in small portion to immediate consumer(s).
Source: Field Survey, October 2007.

The effects on the environment in general of the use of fuelwood should not be considered in isolation and the growth of the metropolitan area and its consequent greater use of energy for all purposes should be thoroughly researched. The activities of man as regards to the extraction and utilization of fuelwood can cause an adverse effect on the vegetation resulting to the following; environmental degradation such as deforestation, loss of biodiversity, soil erosion, flooding, desertification etc. When properly

identified and tackled can reduce the tendency of loss to environmental degradation.

When fail to appreciate the importance, beauty in biodiversity and the lessons learn from studying it, people should at least caution themselves because biodiversity remains great source for immense untapped materials in the form of food, medicine and other commercially imported substances. Many firewood sellers having being in the business for a longtime, which serves as a primary source of livelihood, cut down trees from villages for firewood. This is because no alternative source of income than to venture into the firewood trade.

The most eminent environmental degradation common in this area is the desert encroachment process which is made possible through the destruction of trees/vegetation to be used as fuelwood. Removing trees from large areas (deforestation) without adequate replanting is a common practice in this area, thus vegetation and wildlife habitats are destroyed creating a process for environmental degradation.

This research work is relevant as it attempt to proffer some solutions to the environmental degradation caused through fuelwood extraction which easily aggravates the problem of deforestation in the study area. Furthermore, issues of sustainable development can easily be affected both

qualitatively and quantitatively of the available natural resources from trees.

1.5 DESCRIPTION OF STUDY AREA

1.5.1 BACKGROUND INFORMATION

Borno State was created in 1976, initially comprised the present Borno and Yobe State. Borno State in 1976 covered 116,081 sq Km and embraced a greater part of pre-colonial Borno. Fig. 1.1 Borno State, Nigeria.

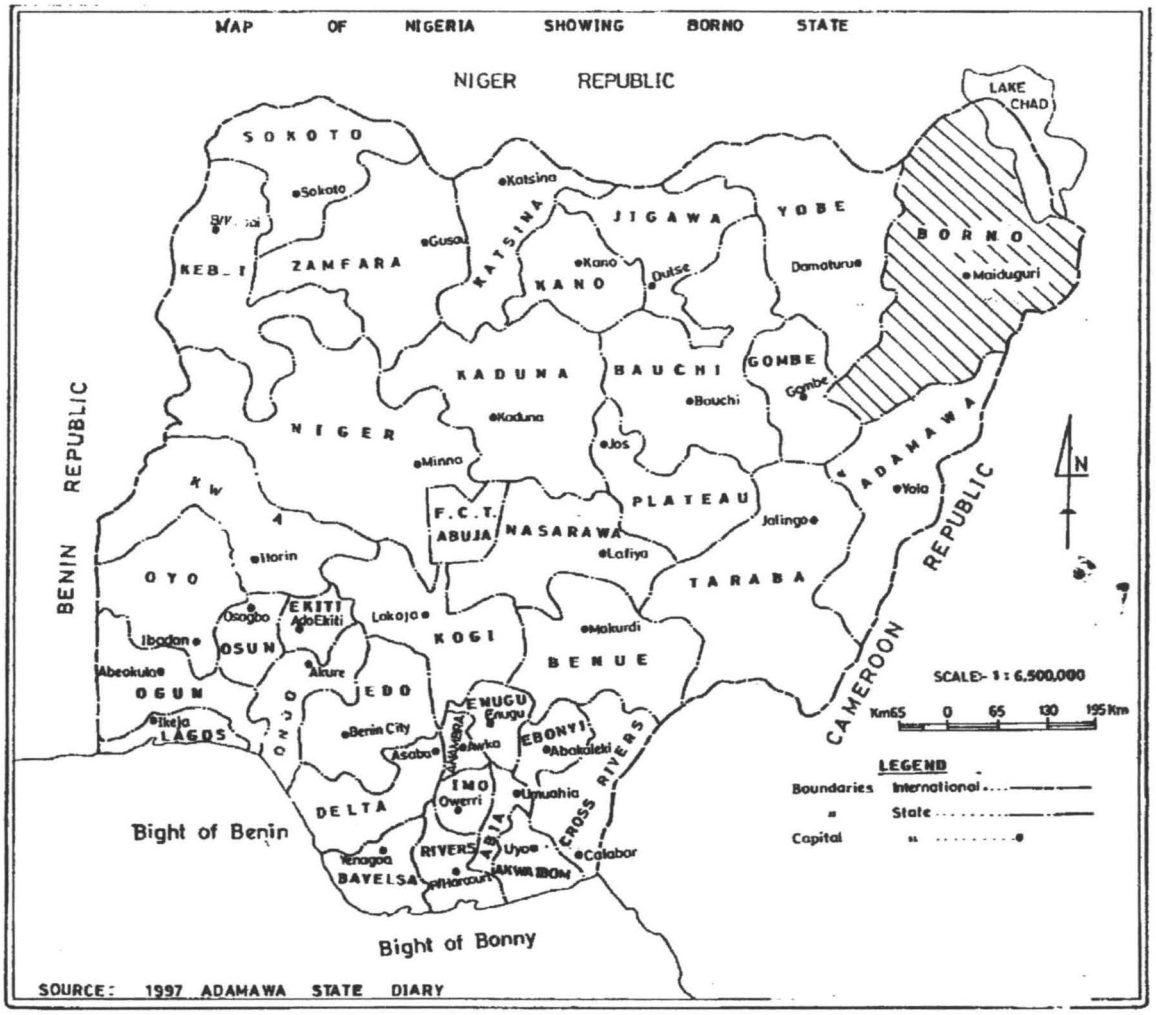

Fig. 1.1 BORNO STATE, NIGERIA

SOURCE: Adamawa State Diary 1997.

Later, in 1991 Yobe State was carved out of Borno State. The present Borno State lies between latitude 10^0 N and 13^0 N and longitude 12^0 E and 15^0 E, which covers 69,435sq Km. Geologically, a greater part of the state lies on the Chad Formation. The volcanic areas of the Biu Plateau and the Basement Complex areas of the Mandara Mountains are found in the south and southeast, respectively. Borno, in the 19th century, was very extensive and the region around Lake Chad. Borno became a province in 1907 and was part of Northern Nigeria until 1967 when the North Eastern State was created, with Maiduguri as the state capital. Borno State was curved out of the former North Eastern State by the General Murtala Mohammed Administration in 1976. In August, 1991, the Babangida regime carved the western part of Borno into Yobe State. Borno State now comprises Twenty-Seven Local Government Area Councils (LGAs). This shows an increase of Six LGAs over what existed in 1993. Each LGA serves as a constituency of the State House of Assembly, irrespective of population size while some LGAs have been merged to form federal constituencies for the National Assembly. The state is divided into Three Senatorial Districts: Borno North, Borno Central and Borno South.

1.5.2 PHYSICAL ENVIRONMENT OF THE STUDY AREA

1.5.2.1 GEOLOGY AND GEOMORPHOLOGY

Physiographically, Borno State could be divided into two broad relief regions, namely the hilly/mountainous area of generally over 600metres above sea-level; and the plains of less than 600 metres above sea level. The highlands dominate the south and south eastern parts of the state, covering about one-third of the total land area of Borno. The remaining two-thirds of the land area are dominated by plains of generally less than 600 metres above sea-level (Udo, 1970).

1.5.2.2 THE HIGHLANDS

Southern and south-eastern Borno is predominantly hilly, geologically underlain by the Basement complex. The areas classified under this category comprise rugged features like mountains (Mandara), plateaux (Biu), ranges of hills (Gwoza), ridges, escarpments, volcanic cones, inselbergs and other related features. Within this relief region are other prominent landscapes such as the Biu Plateau which lies to the south and the Gwoza and Mandara highlands to the southeast (Udo, 1970).

1.5.2.3 THE PLAINS

The bulk of the state, from the central to the northern parts, lies on a vast open plain which is flat or gently undulating. The landscape is developed

on the young sedimentary rocks of the Chad Formation. This extensive plain contains no prominent hills and attains an average elevation of 300m above sea-level, sloping towards the Lake Chad level. The open nature of this landscape, especially its uniformity, is striking during the rainy season when vast areas in the Yedzeram Valley and the immediate neighbourhood of the Lake Chad are flooded. The Chad Formation is overlain by sandy drifts which may be up to 90m thick in central Borno and under which ironstones were formed around Kukawa. The Bama Beach Ridge, made up of layered lacustrine sands and gravels, marked the limit of an expanded Lake Chad which existed during the wet climatic phase in the Sahara about 6,350 years ago (Thiemeyer, 1992).

1.5.2.4 DRAINAGE

The Borno region is drained by two groups of rivers; one is bound towards the south draining to the Benue system, while the other is towards Lake Chad. The region is generally drained by seasonally flowing rivers, whose peak flows are recorded during the rainy season in the months of July and August. The Biu Plateau to the south is largely drained by the Hawul River, which flows southwards and discharges its waters into the Gongola River. The River Yedzeram, which drains the south-eastern and eastern parts of the region, takes its source from the Mandara Mountain and flows north eastward through the pediments and the relatively flat plains towards Lake

Chad. However, the volume of water reaching Lake Chad has been drastically affected in recent years by drought and abstractions upstream. The northern part of Borno is drained by River Yobe which is highly seasonal, recording high flows during the rainy season and reducing to virtually small pools during the dry season. The Sahelian drought of 1972-74 reduced the area of the lake to 9,000sq km. Further drought reduced the lake to just around 3,000sq.km in 1986, thereby exposing large areas as dry lands (Kolawole, 1988).

1.5.2.5 THE SOILS

The soils of Borno State vary in colour, texture, structure, physico-chemical and other essential characteristics from the hilly south to the northern dune landscape. Vertisols dominate the flat plains close to Lake Chad; and also in the depressions. These are heavy dark clay soils (Firki) which develop wide cracks during the dry season. On the dunes are regosols which are shallow with weakly developed profiles. The volcanic and Basement Complex areas have fertile clayey loamy soils in the valley bottoms, but skeletal soils and rock outcrops occur along the gentle and steep slopes.

1.5.2.6 CLIMATE AND VEGETATION

Three seasons have been identified: the Cool Dry (Harmattan) season (October – March), Hot Dry season (April-September). Temperatures are high all the year round, with hot season temperatures ranging between 39^0 C and 40^0 C under the shade. In the southern part of the state, the weather is relatively mild. The rainy season lasts for less than eighty days in extreme north, but is as high as 140 days in the extreme south. The mean annual rainfall is over 800mm on the Biu Plateau but less than 500mm in the extreme north around Lake Chad. Rainfall variability is over 100 per cent. Droughts are endemic and rainfall tends to have been in decline since the 1960s (Department of Meteorological Sciences, 1992). Relative humidity is generally low throughout the state, ranging from as low 13 per cent in the driest months of February and March to the highest values of seventy to eighty per cent in the rainy season months of July and August.

Two vegetation zones are identified in the state: Sudan savannah and Sahel. The semi-arid nature of the Sahel and northern Sudan savannah makes the vegetation consist mainly of open acacia tree savannah. In the wetter south scrub vegetation is interspersed with tall trees and woodland. Vegetation has been greatly modified in most places as a result of over grazing. Land degradation and desertification have been on the increase, causing the desert to advance southwards.

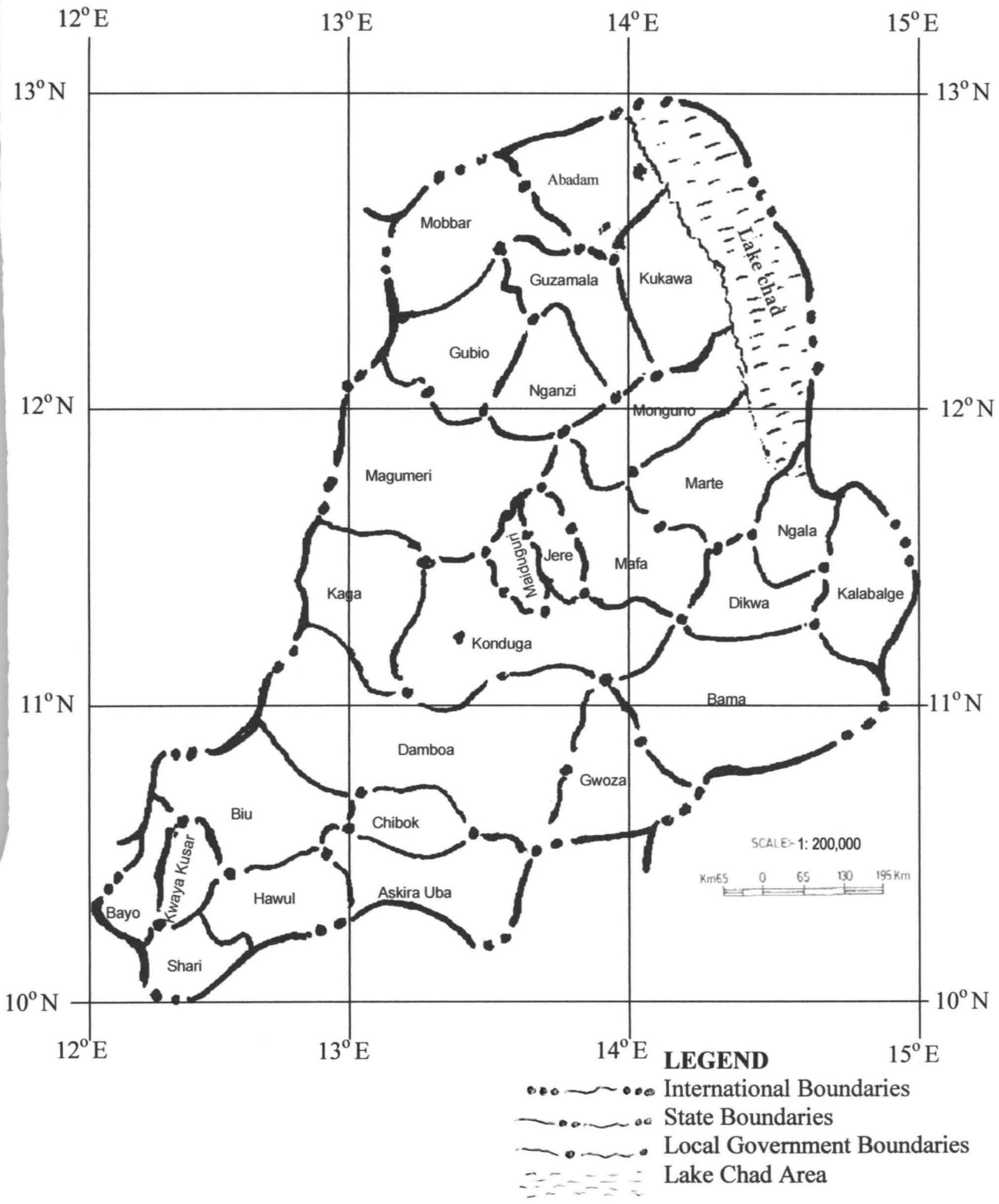

Fig. 1.2 Local Government Area Councils, Borno State, Nigeria

Source: Association of Local Government of Nigeria (ALGON)
Borno State 2007.

1.5.3 HUMAN ENVIRONMENT OF THE STUDY AREA

1.5.3.1 ETHNIC GROUPS AND LANGUAGES

Borno State is quite heterogeneous. The Kanuri is the dominant ethnic group and accounts for about three-quarters of the population of the state. The Kanuri inhabits Abadam, Mobbar, Gubio, Guzamala, Kukawa, Nganzi, Monguno, Marte, Ngala, Kala-Balge, Dikwa, Bama, Konduga, Mafa, Kaga, Magumeri, Damboa, and Maiduguri LGAs. Other ethnic groups are Babur-Bura, Shuwa, Margi, Fulani, Hausa, Gamergu, Kanakuru, Chibok, Ngoshe, Guduf, Mandara, Tera, are several other smaller groups. Babur-Bura is found in Biu, Hawul, Kwaya-Kusar, Bayo and Shani LGAs. The Marghis have their homes in Askira/Uba and parts of Gwoza LGAs. The Mandara of Gwoza LGA is made up of several ethnic sub-groups. The Chibok, another minority group, inhabit the newly created Chibok LGA. The Shuwas form the dominant group and inhabit Mafa, rural Jere, Marte, Monguno, Dikwa, Ngala and Kala-Balge LGAs and also form a significant minority in Bama and Konduga LGAs. Nomadic herdsmen of varied origin are classified as Fulani. They are found in small numbers in all the LGAs in the state. Thirty languages could be considered indigenous languages of the State. Kanuri is the dominant language. The languages of the original inhabitants such as the Gamerbu and Wula are nearly extinct due to 'Kanurisation'. A dialect of Arabic is spoken by the Shuwa Arabs. The Marghis of Damboa have lost their language and now speak only Kanuri.

Hausa and Fulfulde have the majority of their speakers outside the s

Others, like the Marghi and Mandara languages, are spoken by groups with cultural links with Cameroun (Udo, 1970).

1.5.3.2 POPULATION STRUCTURE AND DISTRIBUTION

Borno State population distribution Table 1.4 has a total population of 2,596,589; male were more than females by 58,033. The projected population figures currently put the population of the state at 3,178,225. Although the state has a large area (69,435 sq. km), it's sparsely populated. Average population density is only thirty-seven persons per sq. km (estimated at forty-six persons per sq. km in 1999). rt from Maiduguri with very high density, only the southern LGAs ha oderate densities. The low densities can be explained by harsh clim onditions which afflict a greater part of the state. A rapid rate of urb n is evident in the state, based on the growth of old urban centres a emergence of new ones. Maiduguri, in the 1963 census, had a popula 39,905. The 1991 census puts the figure at 629,486, implying an a wth rate of 12.06 per cent (1963-1991). The creation of new as added momentum to the urbanisation process in the State Government classifies as urban centres all its LGA s and commercial centres with a projected population of over tants (Borno State, 1989 a).

Table: 1.4 **BORNO STATE POPULATION DISTRIBUTIONS AND DENSITY**

L.G.A.	Male	Female	Total
Askira/Uba	80,941	77,952	158,893
Bama	97,989	97,135	195,124
Biu	66,989	65,779	132,169
Damboa/Chibok*	69,123	71,286	140,409
Dikwa	36,594	35,008	71,602
Gubio	33,350	31,398	64,748
Gwoza	79,903	81,451	161,354
Hawul	60,409	67,628	128,045
Kaga	29,559	30,501	60,060
Konduga	62,964	63,951	126,925
Kukawa/Guzamala*	51,073	48,061	99,134
Kwaya-Kusar/Bayo*	42,445	42,056	84,501
Mafa	23,288	23,653	46,941
Magumeri	22,299	23,010	45,309
Maiduguri/Jere*	340,809	288,677	629,486
Marte	35,465	33,563	69,028
Mobbar/Abadam	44,208	41,621	85,829
Monguno	29,004	27,449	56,453
Ngala/Kala-Balge*	65,408	61,045	126,453
Nganzi	26,342	24,737	51,069
Shani	29,760	33,309	63,069
Total	1,327,311	1,269,278	2,596,589

*Data for these LGAs have not been disaggregated by the National Population Commission (1991)

Source: National Population Commission, Borno State.

1.5.3.3 AGRICULTURE

The majority of the people are farmers, herdsmen and fishermen. Agriculture is therefore the mainstay of the economy. The crops grown include guinea corn, millet, maize, rice, wheat, groundnut, cassava, beans and cowpeas. Others are vegetables onions, okra and tomatoes. About 1,794,400 ha. Of land is under crop cultivation. The Chad Basin and Rural Development Authority, Lake Chad Research Institute, Borno State Agricultural Development Programme and Borno State Agricultural

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

Environmental problems have increase significantly over the years as a result of man's activities in and around urban and rural areas. Drummond (1997) specifically mentioned that, the recent Global Assessment of soil degradation carried-out by the International Soil of Netherlands estimates that 15 percent of the earth's land area has been degraded to some degree.

2.2 GLOBAL APPROACH TO SOURCES AND USES OF DIFFERENT ENERGY TYPES (FUELWOOD)

Firewood has been a primary source of heating and cooking for thousands of years. As recently as 1850, wood supplied 90 percent of the fuel used in the United States. Wood now provides less than 1 percent of the energy in the United States, but in many of the poorer countries of the world, wood and other biomass fuels still provide up to 95 percent of all energy used. The 1,500 million m^3 of fuelwood collected in the world each year is about half of all wood harvested as stated by Cunningham and Cunningham (2004). In Northern industrialized countries, wood burning has increased since 1975 in an effort to avoid rising oil, coal and gas prices. Most Northern areas have adequate wood supplies to meet demands at current levels, but problems associated with wood burning may limit further

expansion of this use. The effluent from wood fires can be a major source of air quality degradation and health risk. Polycyclic aromatic compounds produced by burning wood are especially worrisome because they are carcinogenic (cancer-causing).

Cunningham and Cunningham (2004) further mentioned that, two billion people about 40 percent of the total world population – depend on firewood and charcoal as their primary energy sources of these people, three – quarters (1.5 billion do not have an adequate, affordable supply). Many people in the less – developed countries face a daily struggle to find enough fuel to warm their homes, cook their food and do other domestic activities. The problem is intensifying because rapidly growing populations in many developing countries create increasing demands for firewood and charcoal form a diminishing supply.

Cunningham and Cunningham (2004) said, in other countries, however, desperate people often chop down anything that will burn. In Haiti, for instance, more than 90 percent of the once-forested land has been almost completely denuded, and people cut down even valuable fruit trees to make charcoal they sell in the market place. It is estimated that the 1,700 million tons of fuelwood now harvested each year generally is at least 500 million tons less than is needed. By 2025 the worldwide demand for fuelwood is

expected to be about twice current harvest rates, while supplies will not have expanded much beyond current levels. In some African countries, such as Mauritania, Rwanda and the Sudan, firewood demand already is ten times the sustainable yield. More than half of the people in the world depend on firewood or charcoal as their principal source of heating and cooking fuel. Consequently, fuelwood account for slightly more than half of all wood harvested worldwide. Unfortunately, burgeoning populations and dwindling forests are causing wood shortages in many less – developed countries. About 1.5 billion people who depend on fuelwood as their primary energy sources had less than they need. At present rates of population growth and wood consumption, the annual deficit is expected to increase from 500 million m^3 in 2000 to 2,600 million m^3 in 2025. At that point, the demand would be twice the available fuelwood supply. The average amount of wood used for cooking and heating in 63 less–developed countries is about, $1m^3$ per person per year.

Santra (2005) states that biomass is used extensively throughout the world today. The use of fuelwood for cooking is widespread in developing countries as a free good and is usually the only option for the rural poor. The use of biomass is not, however, restricted to the poor of the Third World. For instances, the United States obtains as much energy form

biomass as it does from nuclear power, while Sweden derives 14 percent of its primary energy form biomass, (Santra 2005).

Roper (1995) discovered that firewood accounts for 50 percent of all the wood cut in the world energy and satisfies most of the developing world's energy needs worldwide nearly 3,000 million people use firewood as their principal source of energy, particularly in rural areas and among the least privileged groups in the society. Firewood is collected mostly form unregulated commons.

2.3 AFRICAN APPROACH TO SOURCES AND USES OF DIFFERENT ENERGY TYPES (FUELWOOD)

As firewood becomes increasingly scarce, women and children, who do most of the domestic labour in many cultures, spend more and more hours searching for fuel. In some places, it now takes eight hours or more just to walk to the nearest fuelwood supply and even longer to walk back with a load of sticks and branches that will only last a few days. African Technology Forum (2007) are of the opinion that, "developing countries rely heavily on fuelwood the major energy source for cooking and heating which source of materials is the vegetation (trees) around. In Africa, the statistics are striking; an estimated 90 percent of the entire continent's population uses fuelwood for cooking, and in Sub-Savannah Africa,

firewood and bush supply approximately 52 percent of all energy sources. Land clearing by farmers may contribute as much as fuelwood gathering in the depletion of tree stocks". Currently, about half of all wood harvested each year worldwide is used as fuel. Eighty five (85) percent of that fuel is harvested in developing countries whereas three – quarters of all industrial round-wood (lumber, poles, beams and building materials) is harvested and consumed in developed countries.

Dougill (1977) shows that changes in vegetation cover in the savannah are increasingly being linked to the destruction on vegetation cover in the environment. Human activities have radically reshaped the world's natural land cover. The indiscriminate destruction of vegetation and woodlands, improper management of agricultural land have all collaborated to extensive degradation. The indiscriminate harvesting of trees as a source of energy can easily set in the process of degrading a once fertile land initiate a desert producing cycle that feeds on itself. With nothing to hold back surface run-off, rain drains off quickly before it can soak into the soil to nourish plants or replenish ground water. This idea has been well illustrated by Woodhouse (1997) as he states that 'trees and bushes lose the once productive vegetation as a result of man's activities like harvesting of trees in the environment.'

Forest and woodland is cleared for a variety of motives, to create agricultural and pasture land for example, but the most serious is the so-called "Fuelwood crisis" which is characteristic of many dry lands in the developing world. The collection of fuelwood from urban hinterlands in the Sahel, the most severely affected region has resulted in the almost total loss of trees around major cities. Examples include Ouagadougou (Burkina Faso) and Dakar (Senegal), while the radius of the treeless zone around Khartoum in Sudan is 90 km (56 miles) as states by Microsoft Corporation (1993 – 2003).

Biomass fuels comprising fuelwood and other derived fuels are the major sources of traditional energy in developing countries, often accounting for more than 75 percent of the domestic energy consumption as stated by Jan and Reddy (2003). The proportion of population dependent on biomass energy for cooking and heating is particularly high in countries like Kenya, Tanzania, Mozambique and Zambia with nearly all household using fuelwood for cooking in rural areas and charcoal in over 90 percent of urban households. Wood is a basic commodity used worldwide and is still largely harvested from the wild. It is a primary source of fuel as stated by Biodiversity and its value: Biodiversity Series, Paper No. 1.

Biomass dependence is the highest in Sub-Saharan Africa mostly consumed as domestic energy. The proportion of population that dependent on biomass energy for cooking and heating is particularly high in Kenya, Tanzania, Mozambique, Niger, Mali, Zambia and most other African countries, with nearly all households using fuelwood for cooking in rural areas and charcoal in over 90 percent of urban households.

Mulama (2007) states that "presently many of Africa's poor use trees as a source of energy and income, and may be more inclined to harvest than plant them." Thus, with the above situation we can invest in solar energy (and) hydro power as options so that poor people do not have to cut down trees for fuel. A well-known Kenyan environmentalist and Noble Peace Laureate Wangari Maathai, who has joined the United Nations Environment Programme in a campaign to plant a billion trees by 2007.The initiative was launched Nov.,8 2002. Maathai said, "we know the data, we know the signs of climate change. We can tell people of the drought, floods and so on. But the big question is what do we do about it? At least we can mitigate by planting trees. Anybody can dig a hole, put a tree in the hole and water it to make sure that it survives."

Jan and Reddy (2003) are of the opinion that biomass use accounts for 55 percent in cooking, 20 percent in water heating, 15 percent in space heating

and 10 percent in other uses. Biomass dependence is the highest in Sub-Saharan African, mostly consumed as domestic energy. The proportion of population dependent on biomass energy for cooking and heating is particularly high in most African countries with nearly all household using fuelwood for cooking. Dauda (2006) states that about a decade ago, Ethiopia had 30 percent forest cover, 20 years ago it was down to 4 percent and today it is less than 1 percent. Until this century, India's forests covered more than half of the country; today they are a mere 10 percent and are disappearing fast. Brazil alone maybe losing more than Eight (8) million hectares annually, while in the Tropics generally, 10 trees are being cut for every 1 plant; in Africa, the ratio is 29 to one. Thus, an area larger than the African continent and inhabited by more than 1 billion people is now at the risk from desertification and every year deserts grow by Six million hectares as a result of damage done to the vegetation cover, as a result of indiscriminate harvesting of trees.

In a case study of Muyama in Central Zambia, Kojoba and Chidumayo (1999) states that settlers requires land for cultivation, encroachment has led to clearings in the forest reserves. Often the wood in cleared areas is converted to charcoal for sale to raise income with which to purchase food and inputs such as seeds and fertilizers. They also went ahead to say that some of the cut trees are converted to charcoal for fuel. About 23 percent

of the men and 14 percent of women indicated that they produced charcoal. The sampled settlers sold nearly 28 tonnes of charcoal, of which 65 percent was sold by women. Some herdsmen tried to discourage their subject form making charcoal as an economic activity, but some settlers convert felled trees into charcoal as part of initial field clearance or annual extension in order to raise money for agricultural inputs such as fertilizers.

2.4 NIGERIA APPROACH TO SOURCES AND USES OF DIFFERENT ENERGY TYPES (FUELWOOD)

Even though, Nigeria is endowed with great vegetation cover, the near recklessness and indiscriminate harvesting of trees as a source of energy is posing a serious threat to the environment such as loss of species and biodiversity, increase in atmospheric carbon dioxide (CO_2) with the subsequent rise in global temperature, decrease in rainfall and increase soil erosion, distortion of ecological balance etc. The issues of climate change and its implications have caused so much concern on a global scale; this was confirmed in Johannesburg Summit 'Nigeria', 2002.

Saturday Tribune (2007) specifically mentioned that, "wood is an important source of fuel for poor Northern people who do not necessarily realize the consequences of cutting down trees, according to Fight Against Desert Enforcement (FADE). It is essential, therefore, to limit the extent of

deforestation and to replant trees but such projects are impossible without the support of local communities. "We try to involve the populations by explaining the economic and environmental value of trees, of which they are often unaware", said FADE's Yusuf Ubaid.

For many years, nearly everyone took vegetation for granted. Few persons worried that vegetation resources had finite limits, that they could be lost completely or that the pressures of a burgeoning population would create physical and chemical stresses on these resources. Once a resource is endangered by some impact of man, society can expend large sums of money and time to determine what the problems are and to develop potential solutions, as indicated by FMHUD (2002).

According to FMHUD (2006), in some urban areas only 34 percent of the households have access to electricity; fuelwood therefore constitutes a major source of house energy form the available biomass around. In a case study by Jan and Reddy (2003) are of the opinion that Poverty Reduction Strategy Paper (PRSP) of Ethiopia notes that biomass is a major source of energy for 76 percent rural households that collect fuelwood and for 41 percent of urban households that use purchase fuelwood. About 22 percent and 1 percent of the urban households, respectively use kerosene and electricity for cooking.

Kadiri Associates (2005) is of the opinion that it is interesting to note that the predominance of woodland in the entire North-Eastern region has economic significance for the area. Woods are highly valued as fuel source and because of heavy reliance on this source of energy by a high percentage of the region's population; those who are engaged in the wood business as a source of energy have been taken away from the unemployed group by virtue of this natural resource.

Financial Standard (2008) report that, the Minister of Environment, Housing and Urban Development states that ''illegal cutting of trees for fuelwood accounts for 85 per cent of deforestation in Nigeria, She attributed the statistics to the World Bank''. While also Emmanuel Uduaghan Governor of Delta State has directed the Chairmen of the 25 Local Councils in the State to check indiscriminate felling of trees use as fuelwood and encourage beautification of the environment. Duku (2008) reported that, the Commissioner for Environment in Yobe State claimed that his Ministry has set up a task force to check the activities of firewood commercial sellers and 'forest poachers' that are in the habit of cutting down trees to make a living to the detriment of the environment.

CHAPTER THREE

MATERIALS AND METHODS

3.1 INTRODUCTION

This research project work has looked at Empirical and Inductive studies on trees as a source of energy. Primary Data such as Questionnaire, Possible Interview and Personal visit are considered; likewise Secondary Data are also collected from published materials like Newspaper, Journals and Textbooks etc. Analysis on materials has been carried out based on the characteristics of materials that constitute the source of energy; materials such as charcoal and firewood. Different characteristics of users were also considered.

Questionnaire has been administered to obtain the different views of users and stakeholders in the provision of charcoal and firewood business. Physical observation and possible visit have been carried out where possible.

3.2 DESCRIPTION OF DATA

There are two types of data, namely Primary Data and Secondary Data. In this research work both types of data (Primary and Secondary Data) were used to get meaningful results.

3.2.1 Primary Data:

These are those data collected by the researcher himself /herself or his/her assistant in the field. Data are collected here through administered questionnaire, possible interviews and physical observation, visit to possible areas for first-hand information. Here in this research work primary data was collected through the following methods;

Direct Personal Observation

Oral Interview where possible

Questionnaire Method etc.

3.2.1.1 Direct Personal Observation

This is a method by which the researcher makes his/her observation or takes measurements in the fields with or without the participation of the object of investigation, be it animate or inanimate. Under these method of data collection all plates were taken through direct personal observation.

3.2.1.2 Oral Interview where possible

This is a situation whereby a respondent was engaged in a verbal discussion to extract information as regards the research work. Here respondents gave out data/information base on oral discussion during the period of interview.

3.2.1.3 Questionnaire Method

Here for the purpose of data collection, prepared structured questions was administered as questionnaire method. There are other method of administering questionnaires; namely Personal/Interview Questionnaires and Self Administered Questionnaires. Both of these methods were used.

Personal/Interview Questionnaire: This is a situation where by the researcher and / or his/her assistants ask respondents questions from the questionnaires and responses are recorded on papers or tape recorders.

Self Administered Questionnaire: Here questionnaires are deposited with the respondent to be collected later when on the spot survey is not possible.

For the purpose of this project/research work the two questionnaire methods mentioned above were used. Two thousand (2,000) questionnaires were administered through the two questionnaire method mentioned above. A total number of one thousand nine hundred and twenty four (1924) was collected back from respondents; seventy six (76) questionnaires could not be retrieved. The Study Area covers the entire Local Government Headquarters town as a representative of the Local Government Area Council. The two thousand (2000) questionnaires were divided into twenty seven (27) parts representing the Local Government Headquarters towns.

3.2.2 Secondary Data

These are those information extracted /collected from evaluation of published materials such as Text books, Journals, Magazines, Newspapers, Relevant research work, Lectures from Seminars and Workshops, Government Publications Gazette and Internet services. All the primary data and secondary data collected were subjected to rigorous analysis using various statistical parameters like Systematic Random Sampling etc.

3.3 SYSTEMATIC RANDOM SAMPLING / PURPOSIVE

The Systematic Random Sampling was the type of sampling method used in these research works. These type of method involves Systematic selection of population, for example every 10^{th}, 20^{th}, 30^{th} items in a population. For the purpose of this research work a selection of every 10^{th} residential compound in a street was considered for questionnaire administration in the study area.

3.3.1 Sampling Size Survey

Here, all the Local Government Area Headquarter towns were considered to represent the entire Local Government Area Council each in Borno State.

3.4 DATA ANALYSIS

For computational analysis of the data collected, simple conventional statistical method has been used to analyse the data gathered. Tables, Graphs, Pie-Chart and Plates etc, were used to present the data collected.

CHAPTER FOUR

RESULTS

4.1 INTRODUCTION

This chapter deals mainly with the analysis of data collected from the administered questionnaire giving rise to some level of results after the analysis was carried out. A total number of two thousand (2000) questionnaires were administered and a total of one thousand nine hundred and twenty four (1924) was collected back from respondents. Below are some Tabular and Graphic representations of results from the questionnaire.

4.2 PRESENTATION OF RESULTS

Table: 4.1 **SEX AND MARITAL STATUS**

Location	Sex		Marital status				
	Male	Female	Married	Single	Widow	Widower	Divorced
Abadam	32	20	50	10	5	2	-
Askira/Uba	42	25	49	10	3	1	1
Bama	43	26	56	10	2	1	1
Bayo	43	28	60	9	-	-	1
Biu	50	30	70	15	-	1	-
Chibok	40	22	62	10	1	1	-
Damboa	32	28	80	10	1	1	-
Dikwa	41	20	69	5	1	1	-
Gubio	39	22	57	8	2	-	1
Guzamala	40	25	63	10	1	1	1
Gwoza	39	25	69	11	1	-	-
Hawul	42	25	71	9	1	1	1
Jere	42	23	80	10	3	-	1
Kaga	50	29	73	14	2	1	-
Kala-Balge	30	25	86	4	2	1	-
Konduga	56	33	90	4	7	1	-
Kukawa	48	24	78	7	5	1	-
Kwaya/Kusar	57	30	66	3	5	-	1
Mafa	50	28	70	2	4	1	-
Magumeri	50	22	82	4	2	1	-
Maiduguri	55	37	90	2	5	-	1
Marte	41	25	100	10	6	1	-
Mobbar	48	25	73	6	2	1	-
Monguno	52	35	69	8	1	-	1
Ngala	57	35	72	9	3	-	-
Nganzi	40	24	63	10	2	1	-
Shani	45	24	52	4	3	1	-
Total	1204	720	1404	214	70	20	10
%	62.58	37.42	72.97	11.12	3.64	0.59	0.52

Source: Field Survey October, 2007

Table 4.1: Sex and marital status, 62.58% respondents of the questionnaire were men while 37.42% were female. This shows that more male

responded more than female. The marital status had 72.97% of the responds were married people, while 11.12% were single.

Table: 4.2 **NUMBERS OF FAMILY MEMBERS**

Location	Number of family members				
	2	3-5	6-8	9-12	13 and above
Abadam	5	18	20	3	1
Askira/Uba	8	20	35	9	-
Bama	12	13	25	1	-
Bayo	13	25	30	-	-
Biu	13	20	32	2	-
Chibok	10	22	36	-	1
Damboa	17	29	31	5	1
Dikwa	10	27	23	9	-
Gubio	5	35	32	-	2
Guzamala	11	15	11	8	-
Gwoza	10	17	24	-	1
Hawul	12	14	20	9	1
Jere	8	20	10	-	1
Kaga	10	15	20	9	1
Kala-Balge	10	17	20	-	-
Konduga	10	25	19	13	-
Kukawa	12	28	36	-	1
Kwaya/Kusar	7	30	27	14	-
Mafa	10	25	38	-	-
Magumeri	10	18	20	-	1
Maiduguri	10	20	31	9	-
Marte	6	35	41	-	1
Mobbar	10	20	22	11	-
Monguno	10	29	27	-	-
Ngala	5	29	32	12	1
Nganzi	3	18	27	-	-
Shani	3	20	21	10	1
Total	250	604	710	124	14
%	12.99	31.39	36.90	6.44	0.73

Source: Field Survey October, 2007

Table 4.2: Number of family members, indicates that family members of between 3-8 forms more than 60% of the survey carried out.

Table: 4.3 **EDUCATIONAL ATTAINMENTS OF RESPONDENTS**

Location	Educational level				
	Primary school	Secondary school	Tertiary institution	Informal education (koranic school)	Others-specify
Abadam	5	12	10	32	6
Askira/Uba	5	13	15	40	11
Bama	6	11	15	33	14
Bayo	3	5	13	25	6
Biu	4	12	15	30	19
Chibok	5	5	17	30	5
Damboa	7	10	16	42	6
Dikwa	6	5	15	39	4
Gubio	4	9	15	32	5
Guzamala	5	15	19	35	3
Gwoza	7	11	21	32	9
Hawul	7	7	15	29	8
Jere	6	6	10	46	10
Kaga	7	8	15	32	7
Kala-Balge	5	5	18	31	4
Konduga	5	13	19	36	5
Kukawa	4	10	13	21	4
Kwaya/Kusar	7	12	14	30	7
Mafa	7	5	14	31	4
Magumeri	6	8	19	27	5
Maiduguri	6	7	17	23	25
Marte	4	11	13	28	7
Mobbar	5	7	20	30	6
Monguno	7	9	19	27	4
Ngala	5	4	15	22	7
Nganzi	4	2	17	27	6
Shani	2	10	17	30	9
Total	144	232	426	840	206
%	7.48	12.06	22.14	43.66	10.71

Source: Field Survey October, 2007

Table 4.3: Educational attainment, here Informal education forms 43.66% of the survey in educational attainment, tertiary institution constitutes 22.14% of the survey.

Table: 4.4 **TYPE OF ENERGY USE BY THE FAMILY**

Location	Type of energy use				
	Electricity	Gas (Domestic cooking gas)	Kerosene	Biomass (fuelwood)	Others-specify
Abadam	0	1	28	36	4
Askira/Uba	1	2	20	38	2
Bama	3	4	24	35	1
Bayo	0	1	28	40	3
Biu	3	5	30	34	1
Chibok	1	1	18	49	2
Damboa	1	1	19	47	1
Dikwa	1	1	20	48	2
Gubio	0	1	21	49	1
Guzamala	0	0	26	44	2
Gwoza	1	2	21	45	3
Hawul	0	1	20	50	1
Jere	2	4	27	36	1
Kaga	1	1	21	46	2
Kala-Balge	0	1	19	50	3
Konduga	0	1	20	49	2
Kukawa	0	1	18	50	3
Kwaya/Kusar	0	1	21	49	2
Mafa	0	0	20	51	1
Magumeri	1	1	20	46	2
Maiduguri	3	7	32	31	1
Marte	0	1	19	50	2
Mobbar	0	1	16	52	4
Monguno	1	2	14	53	3
Ngala	1	1	17	50	2
Nganzi	0	1	15	53	3
Shani	0	1	18	51	2
Total	20	44	572	1232	56
%	1.04	2.29	29.73	64.03	2.91

Source: Field Survey October, 2007

Table 4.4: Type of energy use by the family, Biomass (fuelwood) use makes up to 64.97% of the respondents which shows that large number of

people in the survey area mostly used fuelwood as the type of source of energy used by most families.

Table: 4.5 **SOURCE OF FUELWOOD**

Location	Fuelwood source			
	In the nearby bush	From retail outlet in the area	From friends and relations	Others-specify
Abadam	15	54	3	1
Askira/Uba	14	46	5	-
Bama	17	42	4	5
Bayo	11	39	2	2
Biu	25	32	3	1
Chibok	20	40	8	-
Damboa	25	30	5	-
Dikwa	17	29	2	3
Gubio	21	36	1	4
Guzamala	10	45	7	-
Gwoza	19	37	4	6
Hawul	16	54	3	-
Jere	19	50	2	-
Kaga	18	29	4	1
Kala-Balge	14	38	-	1
Konduga	23	47	6	-
Kukawa	19	42	4	-
Kwaya/Kusar	22	39	-	1
Mafa	20	37	3	1
Magumeri	13	49	1	-
Maiduguri	10	50	8	-
Marte	11	31	6	8
Mobbar	22	29	4	-
Monguno	17	39	2	-
Ngala	10	32	3	-
Nganzi	19	25	1	6
Shani	15	38	4	3
Total	462	1216	174	42
%	24.01	63.20	9.04	2.18

Source: Field Survey October, 2007

Table 4.5: Source of fuelwood, Retail outlets is the most sources of fuelwood to consumers it makes up of 63.20% of respondents.

Table: 4.6 **USAGE OF EXTRACTED FUELWOOD**

Location	Usage of fuelwood						
	Cooking only	Heating dwelling only	Commercial purpose only	Options a & b	Both b & c	All of the above	Others
Abadam	10	6	7	27	3	6	2
Askira/Uba	12	7	4	29	2	5	2
Bama	15	9	8	32	9	4	4
Bayo	11	8	6	20	3	6	3
Biu	21	10	5	29	3	5	4
Chibok	13	9	3	22	2	8	2
Damboa	17	10	5	27	3	7	3
Dikwa	10	8	4	29	5	7	3
Gubio	9	9	2	22	7	8	2
Guzamala	10	9	3	20	4	6	2
Gwoza	9	8	3	20	4	7	3
Hawul	10	9	4	22	2	8	2
Jere	19	10	3	19	6	9	2
Kaga	16	9	2	20	3	7	2
Kala-Balge	14	7	3	21	3	10	3
Konduga	17	8	2	20	9	8	2
Kukawa	19	7	4	22	7	10	2
K/Kusar	20	8	7	23	8	8	3
Mafa	23	9	6	27	2	7	1
Magumeri	18	8	7	29	3	9	2
Maiduguri	32	9	11	29	10	18	5
Marte	20	10	8	23	5	5	2
Mobbar	11	9	8	25	9	4	3
Monguno	20	8	7	27	8	5	1
Ngala	12	10	4	21	9	8	2
Nganzi	19	7	5	19	8	9	2
Shani	20	5	7	20	7	8	2
Total	436	226	138	644	144	202	64
%	22.66	11.75	7.17	33.47	7.48	10.5	3.33

Source: Field Survey October, 2007

Table 4.6: Usage of extracted fuelwood, Options 'a' (Cooking only) & 'b' (Heating dwelling place only) was the most option on how the extracted fuelwood is been used as a source of energy with 33.47%, while both

options ‘b’ (heating dwelling only) and ‘c’ (commercial purpose only) only and option ‘f’ accounts for 7.48% and 10.50% respectively.

Table: 4.7 **FREQUENCY OF FUELWOOD USE BY THE FAMILY**

Location	Frequency of fuelwood use by the family			
	1-3 times a day	4-7 times a day	7 times and above	None of the above
Abadam	40	8	-	-
Askira/Uba	37	10	-	-
Bama	47	15	-	-
Bayo	39	20	-	-
Biu	56	15	-	-
Chibok	50	8	-	-
Damboa	42	9	-	-
Dikwa	43	7	-	-
Gubio	37	3	-	-
Guzamala	48	8	-	-
Gwoza	40	8	-	-
Hawul	37	10	-	-
Jere	42	20	-	-
Kaga	31	8	-	-
Kala-Balge	40	7	-	-
Konduga	42	19	-	-
Kukawa	33	9	-	-
Kwaya/Kusar	30	7	-	-
Mafa	37	11	-	-
Magumeri	30	9	-	-
Maiduguri	60	25	-	-
Marte	52	9	-	-
Mobbar	33	7	-	-
Monguno	40	4	-	-
Ngala	37	7	-	-
Nganzi	43	6	-	-
Shani	30	5	-	-
Total	1086	274	-	-
%	56.44	14.24	-	-

Source: Field Survey October, 2007

Table 4.7: Frequency of fuelwood use by the family, the frequency how family use fuelwood shows that 1-3 times a day have 56.44% while 4-7 times a day account for 14.24%.

Table: 4.8 **AMOUNT SPENT ON FUELWOOD DAILY**

Location	Money spend on fuelwood daily				
	₦0-₦30	₦31-₦40	₦41-₦50	₦51-₦100	₦101 and above
Abadam	6	20	20	6	3
Askira/Uba	4	18	29	7	4
Bama	16	22	42	8	6
Bayo	3	19	28	5	2
Biu	17	35	47	9	5
Chibok	8	18	20	6	3
Damboa	5	14	27	7	4
Dikwa	6	15	22	5	4
Gubio	7	17	22	8	3
Guzamala	8	14	24	5	2
Gwoza	7	17	29	5	4
Hawul	7	23	27	6	2
Jere	9	29	59	7	3
Kaga	6	21	29	9	1
Kala-Balge	7	22	30	7	1
Konduga	5	27	23	5	4
Kukawa	6	19	31	6	2
Kwaya/Kusar	8	18	23	5	1
Mafa	7	19	27	7	1
Magumeri	8	17	29	6	1
Maiduguri	22	42	62	12	9
Marte	7	21	44	6	4
Mobbar	8	17	29	9	3
Monguno	8	19	32	8	4
Ngala	9	20	30	8	3
Nganzi	6	18	29	9	3
Shani	6	17	28	5	2
Total	216	558	842	186	86
%	11.23	29.00	43.76	9.67	4.47

Source: Field Survey October, 2007

Table 4.8: Amount spent on fuelwood daily, 43.76% spend ₦41 to ₦50 daily on purchase of fuelwood. Whereas 4.47% spend ₦101 and above on fuelwood daily.

Table: 4.9 **TRADE / PROFESSION THAT USES FUELWOOD**

Location	Trade / Profession that uses fuelwood				
	Blacksmith	Local food vendors/ hotels	'Suya' meat sellers	Beans cake sellers (mai kosai)	Others-specify
Abadam	7	12	4	27	11
Askira/Uba	3	12	6	25	9
Bama	13	20	7	40	13
Bayo	5	15	6	49	10
Biu	16	30	15	22	15
Chibok	8	13	5	20	9
Damboa	6	14	7	15	10
Dikwa	5	16	9	20	6
Gubio	7	19	5	18	9
Guzamala	4	11	6	30	9
Gwoza	8	22	15	25	10
Hawul	10	27	16	27	9
Jere	12	29	19	12	12
Kaga	9	20	6	16	8
Kala-Balge	6	27	5	23	6
Konduga	4	25	6	24	7
Kukawa	8	21	7	27	6
Kwaya/Kusar	6	29	8	17	7
Mafa	4	33	6	19	10
Magumeri	5	20	7	14	12
Maiduguri	18	55	6	32	16
Marte	6	23	8	12	9
Mobbar	5	29	6	15	8
Monguno	4	27	5	16	9
Ngala	6	29	7	12	10
Nganzi	5	20	5	13	12
Shani	6	22	6	14	12
Total	196	620	226	604	264
%	10.19	32.22	11.75	31.39	13.72

Source: Field Survey October, 2007

Table 4.9:Trade / profession that uses fuelwood, local food vendors / hotels account for 32.22% out of the trade or profession that utilizes

fuelwood. Beans cake sellers 'mai kosai' have 31.39% of the survey trade/profession that uses fuelwood as a source of energy.

Table: 4.10 **OPINIONS ON HOW TO AVOID NEGATIVE OBSERVATION / IMPACT**

Location	How to avoid negative impact				
	Encourage more environmental enlightenment	Community participation in govt. policy	Provision of seedlings to raise trees /forest	Prosecute offenders	Others-specify
Abadam	10	28	17	4	-
Askira/Uba	15	27	21	6	1
Bama	25	30	20	10	2
Bayo	15	25	19	8	-
Biu	30	36	25	9	3
Chibok	19	27	15	5	5
Damboa	14	31	21	4	-
Dikwa	9	29	17	10	-
Gubio	12	26	18	3	-
Guzamala	7	29	16	7	-
Gwoza	20	31	20	11	1
Hawul	19	25	22	9	-
Jere	21	37	27	10	2
Kaga	10	25	20	2	1
Kala-Balge	13	29	19	6	-
Konduga	11	27	16	8	-
Kukawa	9	29	14	11	-
Kwaya/Kusar	9	22	10	9	1
Mafa	5	24	10	10	-
Magumeri	10	28	19	3	-
Maiduguri	35	40	35	15	5
Marte	10	30	20	4	-
Mobbar	9	27	15	4	1
Monguno	19	25	21	5	-
Ngala	16	26	20	7	1
Nganzi	8	30	19	4	-
Shani	10	35	20	7	1
Total	390	778	516	192	24
%	20.27	40.44	26.82	9.98	1.25

Source: Field Survey October, 2007

Table 4.10: Opinion on how to avoid negative observation / impact, suitable solutions to avoid the negative observation/impact caused by fuelwood extraction are through community participation in government policy with 40.44%. Provisions of seedlings to raise or forest and guard forest reserves accounts for 26.82% of different opinion. The encouragement of more environmental enlightenment can also help to avoid the negative impact of fuelwood extraction which account for 20.27%.

Table 4.11 **Observed Frequency on the types of Energy use by Families**

Location	Electricity	Gas(domestic cooking gas)	Kerosene	Biomass (Fuelwood)	Others-Specify	**Total**
Abadam	0	1	28	36	4	**69**
Askira/Uba	1	2	20	38	1	**63**
Bama	3	4	24	35	1	**67**
Bayo	0	1	28	40	3	**72**
Biu	3	5	30	34	1	**73**
Chibok	1	1	18	49	2	**71**
Damboa	1	1	19	47	1	**69**
Dikwa	1	1	20	48	2	**72**
Gubio	0	1	21	49	1	**72**
Guzamala	0	0	26	44	2	**72**
Gwoza	1	2	21	45	3	**72**
Hawul	0	1	20	50	1	**72**
Jere	2	4	27	36	1	**70**
Kaga	1	1	21	46	2	**71**
Kala-Balge	0	1	19	50	3	**73**
Konduga	0	1	20	49	2	**72**
Kukawa	0	1	18	50	3	**72**
Kwaya/Kusar	0	1	21	49	2	**73**
Mafa	0	0	20	51	1	**72**
Magumeri	1	1	20	46	2	**70**
Maiduguri	3	7	32	31	1	**74**
Marte	0	1	19	50	2	**72**
Mobbar	0	1	16	52	4	**73**
Monguno	1	2	14	53	3	**73**
Ngala	1	1	17	50	2	**71**
Nganzi	0	1	15	53	3	**72**
Shani	0	1	18	51	2	**72**
Total	**20**	**44**	**572**	**1232**	**56**	**1924**

Source: Field Survey October, 2007

Table 4.11Observed frequency on the types of energy use by families shows how families in the study area make use of the available and affordable source of energy.

The Expected Frequency, E was calculated from the Observed Frequencies by using the formula:

$$E = \frac{\text{Row Total x Column Total}}{\text{Overall Total}}$$ For example, $\frac{20 \times 69}{1924} = 0.72$

The Expected Frequency for Electricity, Gas (Domestic cooking gas), Kerosene, Biomass (Fuelwood) and Others- Specify were all calculated in the same manner.

Table 4.12 **Expected Frequency on the types of Energy use by Families calculated from Table 4.11**

Location	Electricity	Gas(domestic cooking gas)	Kerosene	Biomass (Fuelwood)	Others-Specify	Total
Abadam	0.72	1.58	20.51	44.18	2.01	69
Askira/Uba	0.65	1.44	18.73	40.34	1.83	63
Bama	0.70	1.53	19.92	42.90	1.95	67
Bayo	0.75	1.65	21.41	46.10	2.10	72
Biu	0.76	1.67	21.70	46.74	2.12	73
Chibok	0.74	1.62	21.11	45.46	2.07	71
Damboa	0.72	1.58	20.51	44.18	2.01	69
Dikwa	0.75	1.65	21.41	46.10	2.10	72
Gubio	0.75	1.65	21.41	46.10	2.10	72
Guzamala	0.75	1.65	21.41	46.10	2.10	72
Gwoza	0.75	1.65	21.41	46.10	2.10	72
Hawul	0.75	1.65	21.41	46.10	2.10	72
Jere	0.73	1.60	20.81	44.82	2.04	70
Kaga	0.74	1.62	21.41	45.46	2.07	71
Kala-Balge	0.76	1.67	21.70	46.74	2.12	73
Konduga	0.75	1.65	21.41	46.10	2.10	72
Kukawa	0.73	1.65	21.41	46.10	2.10	72
Kwaya/Kusar	0.77	1.67	21.70	46.74	2.12	73
Mafa	0.75	1.65	21.41	46.10	2.10	72
Magumeri	0.73	1.60	20.81	44.82	2.04	70
Maiduguri	0.77	1.69	22	47.38	2.15	74
Marte	0.75	1.65	21.41	46.10	2.10	72
Mobbar	0.76	1.67	21.70	46.74	2.12	73
Monguno	0.76	1.67	21.70	46.74	2.12	73
Ngala	0.74	1.62	21.11	45.46	2.07	71
Nganzi	0.75	1.65	21.41	46.10	2.10	72
Shani	0.75	1.65	21.41	46.10	2.10	72
Total	20	44	572	1232	56	1924

Source: Field Survey October, 2007

Table 4.12, Expected frequency on the types of energy use by families, indicates the expected frequency that families in the study area are expected to use the different energy types.

Table 4.13 **Combined Observed and Expected Frequency on the types of Energy use by Families calculated from Table 4.11 and 4.12.**

Location	Electricity		Gas(domestic cooking gas)		Kerosene		Biomass (Fuelwood)		Others-Specify	
	O	**E**	**O**	**E**	**O**	**E**	**O**	**E**	**O**	**E**
Abadam	0	0.72	1	1.58	28	20.51	36	44.18	4	2.01
Askira/Uba	1	0.65	2	1.44	20	18.73	38	40.34	2	1.83
Bama	3	0.70	4	1.53	24	19.92	35	42.90	1	1.95
Bayo	0	0.75	1	1.65	28	21.41	40	46.10	3	2.10
Biu	3	0.76	5	1.67	30	21.70	34	46.74	1	2.12
Chibok	1	0.74	1	1.62	18	21.11	49	45.46	2	2.07
Damboa	1	0.72	1	1.58	19	20.51	47	44.18	1	2.01
Dikwa	1	0.75	1	1.65	20	21.41	48	46.10	2	2.10
Gubio	0	0.75	1	1.65	21	21.41	49	46.10	1	2.10
Guzamala	0	0.75	0	1.65	26	21.41	44	46.10	2	2.10
Gwoza	1	0.75	2	1.65	21	21.41	45	46.10	3	2.10
Hawul	0	0.75	1	1.65	20	21.41	50	46.10	1	2.10
Jere	2	0.73	4	1.60	27	20.81	36	44.82	1	2.04
Kaga	1	0.74	1	1.62	21	21.11	46	45.46	2	2.07
Kala-Balge	0	0.76	1	1.67	19	21.70	50	46.74	3	2.12
Konduga	0	0.75	1	1.65	20	21.41	49	46.10	2	2.10
Kukawa	0	0.75	1	1.65	18	21.41	50	46.10	3	2.10
Kwaya/Kusar	0	0.76	1	1.67	21	21.70	49	46.74	2	2.12
Mafa	0	0.75	0	1.65	20	21.41	51	46.10	1	2.10
Magumeri	1	0.73	1	1.60	20	20.81	46	44.82	2	2.04
Maiduguri	3	0.77	7	1.69	32	22.00	31	47.38	1	2.15
Marte	0	0.75	1	1.65	19	21.41	50	46.10	2	2.10
Mobbar	0	0.76	1	1.67	16	21.70	52	46.74	4	2.12
Monguno	1	0.76	2	1.67	14	21.70	53	46.74	3	2.12
Ngala	1	0.74	1	1.62	17	21.11	50	45.46	2	2.07
Nganzi	0	0.75	1	1.65	15	21.41	53	46.10	3	2.10
Shani	0	0.75	1	1.65	18	21.41	51	46.10	2	2.10

Source: Field Survey October, 2007

Note: O = Observed Frequency

E = Expected Frequency

The Test of the Hypothesis was carried out by the use of Chi-square calculation, see Appendix B.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 DISCUSSION

Having carried out the necessary research work to acquire some data/information, it has become expedient at this stage to present, analyze and interpret the data and information gathered. The descriptive aspect of the data analysis was based on frequency – percentage method where tabulations, graphs, charts, figures and other statistical data were used to enhance clarity. The Inferential methods of data analysis include the choice of hypothesis test, chi-square, analysis of data and decision rule from results arrived. It should be noted that the method of data analysis was chosen to ensure near accuracy, simplicity, reliability easy understanding and to allow for ease of presentation and interpretation.

5.1.1 Personal data

Here issues like name, sex (male/female), marital status, number of family members, educational attainment were all analyzed to extract information used in result presentation. Most respondents were reluctant to state their names on the questionnaire. Table 4.1 shows that male respondents are more than female, some due to religious and cultural belief in such areas. Here only married men were allowed to speak on behalf of a family or

compound. Most married men were responsible for the provision of fuelwood to their family, even though there are some unmarried respondents who are in the habit of fuelwood extraction both for commercial and personal use at home.

Table 4.2 shows the number of family members; here number plays a vital role in fuelwood extraction and utilization. The larger the number of family members the more consumption of fuelwood recorded. This is because more fuelwood could be needed for heating dwellings, cooking and other domestic activities that consume fuelwood. In a family of few members, say two, it is possible that less fuelwood can be consumed for domestic activities such as cooking and heating dwelling places.

In Table 4.3, the educational attainment of the respondents is shown. It shows clearly that those who have attended secondary school and tertiary institutions have some level of knowledge about environmental degradation caused as a result of fuelwood extraction and utilization. Such categories of respondents are of the opinion of using alternative sources of energy such as electricity, gas (domestic cooking gas), kerosene etc when it is available and affordable to them. Most illiterate respondents do not have any knowledge or accept/acknowledge that fuelwood extraction and utilization can cause environmental degradation. Some are of the belief that

fuelwood is the best source of energy for cooking and heating dwelling places. Thus, perception of such category of people to fuelwood is entirely different from those with certain level of educational attainment.

5.1.2 Energy Utilization

The types of energy used by the family in the study area are electricity, gas (domestic cooking gas) kerosene and biomass (fuelwood). Kerosene and biomass respondents form 87.94% of the administered questionnaires as shown in Table 4.4. Biomass (fuelwood) accounts for 64.97% of the total respondents. This shows that large number of people, mostly female in the survey area use fuelwood as the main source of energy. Both educated and non-educated people use fuelwood as a source of energy, but it is mostly used by non-educated people. Some of the educated people have been found to supplement fuelwood with kerosene stove and sometimes gas (domestic cooking gas) when available and affordable.

The research findings show in Table 4.5 that the sources of fuelwood are mostly from retail outlets in the area, representing 63.20%. Some personally source the fuelwood from nearby bush, while others source it from friends and relations. Here certain numbers of people usually make arrangements among themselves on how and when to go out to the bush to extract fuelwood for commercial purpose or domestic uses.

Cooking, heating dwelling places and other domestic activities was the most chosen option on how the extracted fuelwood was used as a source of energy as indicated in Table 4.7. The frequency of fuelwood use by the family is 1-3 times a day. Most families use fuelwood for cooking and other domestic activities. Table 4.8 above shows respondents spend at least between ₦10 to ₦50 daily to purchase fuelwood. This category of respondents represents 83.99% of the total sample population. Here some respondents are of the opinion that at least above 10% of their daily income was being used the purchase of fuelwood. During the field survey period, some trades/professions were discovered to depend mainly on fuelwood as their source of energy.

5.1.3 Strategies for prevention

From Table 4.10, it was observed that different families make use of different types of energy. The sample surveyed area can be said to be connected to the National Grid. One of the most serious challenges is the non-availability of adequate and stable supply of electricity making it difficult to make electricity as the type of energy used by most families. Gas (domestic cooking gas) was also not different from electricity. Here, when it is available, affordability makes it difficult due to the high selling price of the commodity.

Kerosene can be said to be relatively available and affordable sometimes. It was the second largest type of energy used by most families during the field survey period. Average people and those who can afford the current selling price of the commodity in the survey area do patronize.

Fuelwood was the most common source of energy used by most families in the study area. This source of energy (fuelwood) is readily available and at least affordable all over the study area. Almost every family use fuel wood in one domestic activity or the other.

These research findings revealed that most illegal cutting down of trees for fuelwood gives rise to deforestation in the study area. The northern part of the study area is mostly affected due to the excessive exploitation of the few available trees. Such activities of over exploitation of trees easily create conducive process for environmental degradation like deforestation, desertification and soil erosion. Some respondents claimed to be ignorant of the danger caused by over exploitation of trees used as fuelwood. Others claimed to accept any substitute to fuelwood that can be available and affordable at all time to them. Opinion varies as regard to the solution of fuelwood extraction and utilization; some are for the community participation in government policy formulation to implementation level, while others are for provision of more different seedlings to raise

community/individual forest reserves. Government and Non-governmental Organization can also play a vital leading role in environmental enlightenment exercises through the media, posters, jingles, mobile cinema shows etc.

Testing the hypothesis at 5% level of Significance by using mathematics statistical and formulae table shows that the tabulated figure result was 104, while the statistical calculated Chi-Square result was 130.54. The Decision Rule states that Reject H_O Hypothesis if tabulated value is greater than calculated Chi-Square result. Since, the calculated value was greater than the tabulated value the hypothesis was rejected. This means that environmental concern and management approaches do not form a part of rural communities concern. The result of the Hypothesis being tested revealed that the environmental concern and management approaches should form part of the rural communities concern.

5.2 SUMMARY

Presently, many of Africa's poor use trees as a source of energy, income and may be more inclined to harvest than to plant them. Thus, deforestation can be seen as a local issue with global consequences. Therefore, actors such as NGOs, donor governments, and the countries of Sub-Saharan African must work together to combat the problem. African countries must take greater responsibility because ultimately their people are most

affected. As many countries move toward the Millennium Development Goals (MDGs) horizon rural energy consumption may become diversified with a mix of traditional fuels and modern sources such as kerosene, LPG and electricity. However the transition may get significantly delayed due to slow growth in income per capita. There is an urgent need to explore different options relating to the efficiency of modern convectional fuels and renewable such as hydro, wind, solar energy. The World Summit on Sustainable Development (WSSD) declaration called for a significant increase in the proportion of renewable energy in the total energy use worldwide, specifically in African countries.

The logging of firewood for economic activity is on the increase thereby impending on the afforestation program of the government. Thus the collection of firewood poses a measureable threat to the environment because man deliberately or accidentally indulges in bringing the desert closer. Though seemingly resilient, our earth is a fragile balance of many Interconnecting systems, and we aren't sure when the damage being done may be deadly to life as we know it. Sustainability which means the efficient use of our resources through reduction, reuse, recycling and pollution prevention can be a good way of managing the fragile ecosystem. It is as a result of this development that observers believe strongly that, the issue of environmental degradation goes beyond organizing seminars and

workshops to discuss the way forward; what is needed is the full implementation of those policies. The problem of environmental degradation should therefore be tackled through the efforts of the government, the people and other stakeholders.

5.3 CONCLUSION

Reduced availability of traditional fuels may not necessarily lead to growth in modern and conventional fuels, since the substitution between traditional biomass fuel such as fuelwood, crop residues, and dung is a more general phenomenon than substitution with conventional fuels. Proportion of biomass energy is expected to decline in regions other then Africa, while it is expected to grow in Africa because of population growth and slow rate of economic growth. Most data on energy consumption at the National level are derived from energy balance studies, sector studies while budget and expenditure surveys data are often missing. Since traditional fuels are not traded, they are also not captured in the energy / GDP elasticity's estimated from energy balance studies. Lack of a nodal agency, inadequate policy support data scarcity, and lack of analytical studies on traditional energy issues are other impediments. Traditional fuels have recently been included in the energy modeling and forecast framework of the International Energy Agency (IEA 1998-2002) under combustible renewable and wastes. The 19th Edition of the Survey of Energy Resources

2001 published by the World Energy Council also provides documentation of traditional energy sources of selected countries (WEC 2001). Lack of stakeholder's awareness and participation, poor enforcement mechanism and overlap of functions all led to unsatisfactory results. Anybody can dig a hole, put a tree in the hole and water it to make sure that it survives. Environmental sustainability, economic development and social advancement are interdependent, it is impossible to think of long-term conservation of tropical forest ecosystems without thinking of the needs of the societies that are dependent on them. Our current knowledge and technologies, as imperfect as they are, can conserve much more of the remaining tropical forests and do much more to meet the basic needs of people than is being done now. The survival clock is ticking. In the time it took you to read this project, more than 3000 people were born and more than 550 hectares of forest were lost in developing countries. More, a lot more can be done. Now is the time to do it.

5.4 RECOMMENDATIONS

More support must be given to environmental awareness campaigns. Awareness-building must reach people living in the rural areas, cities, urban centres, adults and children, rich and poor. Decision makers in developing countries must understand the causes and consequences of mismanagement of the tropical forests, the potential benefits of sustainable

use and the appropriate, alternative actions they can take. Campaigns must move beyond the ''beauty -of -nature'' focus or the ''for-the-good-of-your-grandchildren'' appeal. Sound, quantifiable arguments must be made about the economic and social benefits of wise use of the forest resources. It is only through an informed public and informed leadership that the political will can be found to make the tough policy decisions required. Various programmes should be undertaken to enlighten, educate, raise public awareness and entertain the public at large through media (print and electronic) campaigns, exhibitions, mobile cinema shows, drama sketches, radio jingles, fliers and posters where possible through local languages/tribes etc, on environmental issues including the need to protect and conserve trees (vegetation).

Reforms to natural resource policies and other policies affecting forest lands should be given the highest priority. Before project-level or community-level interventions can have a meaningful effect. Policies should reflect the environmental importance of the forests as well as their economic value and the appropriate roles of the public and private sectors in implementing the policies. Government policies should give priority to establishing the scientific infrastructure and human resource capacity to conduct forest-related research.

A way of addressing the fuelwood problem advocated by agencies such as the World Bank, is based on the idea that eliminating open-access sources of fuelwood. Other proposals focus directly on the use of fuelwood. This may be done by providing more efficient methods of burning fuelwood, such as the fuel efficient Lorena stoves. This form of technology transfer has been introduced in refugee camps where deforestation is common. However, the mere introduction to superior technology is ineffectual without modifying the behaviour of those using them. Through vigorous campaign by related Agencies and Ministry of Environment on the effect of cutting down of trees to be used as fuelwood at high rate can be minimized through public awareness. Many schools can be involved in float activities, posters, competitions, radio discussions and competitions, radio discussions, jingles, reading relevant and related publications. Private sector/citizens should become involved in educating, enlightening the general public about the inherent danger in the destruction of trees as an alternative source of energy. Trees and other types of lignocelluloses materials may be grown specifically for burning as bio-fuels. By the choice of appropriate species, sites, planting densities and harvesting schedules, bio-fuel can be grown at competitive costs. Certain crops have high energy conversion efficiency in appropriate locations, crops such as eucalyptus trees, rubber plants or sunflowers might be used because of their growth

and high energy content. The stored chemical energy can be converted directly to heat by combustion or processed into liquid or gaseous fuels.

Environmentalist should not be the only ones in search of this solution, others like Economist, Engineers, Sociologist among others should be involved in saving the environment. An integrated-interdisciplinary approach would seem the best option. And the major part of the answer to the problem of man's destruction of his own environment must lie with education, with an awareness of the basis of ecosystem dynamics; the threat would be easily emancipated.

For effective environmental standards and quality controls policy have to be established with respect to manner and ways trees should be planted to replace those cut down. Routine monitoring and alert relevant government agencies to the appropriate law enforcement measures to be taken against defaulters. Environmental laws and policies can reinforce efficiency in resource use and provide incentives for adopting less damaging technologies. The protection of renewable resources, as well as the wise and efficient use of non-renewable resources are of the utmost importance if our global economic system is to continue to develop and proper, and if economic progress is to avoid sacrificing the legitimate needs of future generations. The effects on the environment in general of the use of fuelwood should not be considered in isolation and the growth of the

metropolitan area and its consequent greater use of energy for all purposes should be thoroughly researched.

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APPENDIX - A

Federal University of Technology Minna

School of Environmental Technology

Department of Geography

Environmental Management.

October, 2007.

Dear Sir, Madam, Alhaji, Hajjia, Mallam, Mallama.

Research Questionnaire a Survey on the Sources and uses of different Energy types in Borno State, Nigeria.

I am a Post-Graduate student from the above mentioned school conducting a research on the topic above. Your response is highly solicited to enable me carry out academic work. All response will be carried out with utmost confidentiality.

Thanks.

Yours faithfully,

Ibrahim, Danjuma

M.Tech/SSSE/2005/1379

SECTION A: PERSONAL DATA

Please Tick as appropriate:

1. Name(s) if possible.....
2. Sex (a) Male (b) Female
3. Marital Status:

   (a)Married (b) Single (c) Widow (d) Widower (e) Divorced
4. Number of Family members

   (a) 2 (b) 3-5 (c) 6-8 (d) 9-12 (e) 13 and above.
5. Educational Attainment

   (a) Primary School (b) Secondary School (c) Tertiary Institution

   (d) Informal Education (Koranic School) (e) Others-specify .....
6. Tribe

   (a) Kanuri (b) Bura (c) Marghi (d) Hausa (e) Others-specify.....

SECTION B: ENERGY UTILISATION

7. What type of energy do you use by your family?

   (a) Electricity (b) Gas (domestic cooking gas) (c) Kerosene (d) Biomass (fuelwood) (e) Others-specify .....
8. How do you get your fuelwood?

   (a) In the nearby bush (b) From retail outlet in the area

   (c) From friends and relations (d) Others - specify.....
9. What do you use the extracted fuelwood for?

   (a) Cooking only (b) Heating dwelling place only

   (c) Commercial purpose only (d) Both (a) and (c)

   (e) Both (b) and (c) (f) All of the above

   (g) Others-specify .....
10. How frequent do you use fuelwood by the family?

    (a) 1-3 times a day (b) 4-7 times a day (c) 7 times and above

    (d) None of the above

11. How much do you spend on the fuelwood daily?

(a) ₦ 0-₦30 (b) ₦31-₦ 40 (c) ₦ 41-₦50 (d) ₦51- ₦100

(e) ₦100 and above

12. What type of trade/profession utilizes fuelwood that you know?

(a) Blacksmith (b) Local food vendors/hotels

(c)'Suya' meat sellers (d) Beans Cake Sellers (Mai Kosai)

(e) Others-specify.....

SECTION C: IMPACT OF FUELWOOD EXTRACTION

13. Have you noticed any effects/impacts on trees over the years due to extraction activities of fuelwood?

(a) Yes (b) No

14. If No. 13 above is Yes, what do you think of this observation/impact?

(a) Positive (b) Negative

15. If you think No. 14 above is Positive; why? .....

.....

16. If you think No. 14 above is Negative; why? .....

.....

SECTION D: STRATEGIES FOR PREVENTION

17. What do you think should be done to avoid this negative observation / impact?

(a) Encourage more environmental enlightenment

(b) Community participation in government policy

(c) Provision of seedlings to raise trees/forest

(d) Prosecute offenders (e) Others- specify.....

18. If you have a choice, would you stop using fuelwood?

(a) Yes (b) No

19. What is your reason, if Yes?

.....

.....

20. What is your reason, if No?

.....

.....

21. Do you know any government agency, Non-governmental Organisation that previously or recently attempt to stop or control fuelwood extraction in your area?

(a) Yes (b) No

22. If No. 21 above is Yes, what were the measures suggested to you for controlling fuelwood extraction and utilization in your area?

.....

.....

APPENDIX – B

Chi- square calculations for electricity

Location	O	E	O-E	$(O-E)^2$	$\frac{(O-E)^2}{E}$
Abadam	0	0.72	0.72	0.52	0.72
Askira/ Uba	1	0.65	0.35	0.12	0.01
Bama	3	0.70	2.30	5.29	7.56
Bayo	0	0.75	0.75	0.56	0.75
Biu	3	0.76	2.24	5.02	6.61
Chibok	1	0.74	0.26	0.07	0.09
Damboa	1	0.72	0.28	0.08	0.11
Dikwa	1	0.75	0.25	0.06	0.08
Gubio	0	0.75	0.75	0.56	0.75
Guzamala	0	0.75	0.75	0.56	0.75
Gwoza	1	0.75	0.25	0.06	0.08
Hawul	0	0.75	0.75	0.56	0.75
Jere	2	0.73	1.27	1.61	2.21
Kaga	1	0.74	0.26	0.07	0.09
Kala-Balge	0	0.76	0.76	0.58	0.76
Konduga	0	0.75	0.75	0.56	0.75
Kukawa	0	0.75	0.75	0.56	0.75
K / Kusar	0	0.76	0.76	0.58	0.76
Mafa	0	0.75	0.75	0.56	0.75

Magumeri	1	0.73	0.27	0.07	0.10
Maiduguri	3	0.77	2.23	4.97	6.45
Marte	0	0.75	0.75	0.56	0.75
Mobbar	0	0.76	0.76	0.58	0.76
Monguno	1	0.76	0.24	0.06	0.08
Ngala	1	0.74	0.26	0.07	0.09
Ngazi	0	0.75	0.75	0.56	0.75
Shani	0	0.75	0.75	0.56	0.75
Total					**34.06**

Source: Field Survey October, 2007

Note: O = Observed Frequency

E = Expected Frequency

Chi- square calculations for gas (domestic cooking gas)

Location	O	E	O-E	$(O-E)^2$	$\frac{(O-E)^2}{E}$
Abadam	1	1.58	0.58	0.34	0.22
Askira/ Uba	2	1.44	0.56	0.31	0.22
Bama	4	1.53	2.47	6.10	3.99
Bayo	1	1.65	0.65	0.42	0.26
Biu	5	1.67	3.33	11.09	6.64
Chibok	1	1.62	0.62	0.38	0.23
Damboa	1	1.58	0.58	0.34	0.22
Dikwa	1	1.65	0.65	0.42	0.26
Gubio	1	1.65	0.65	0.42	0.26
Guzamala	0	1.65	1.65	2.72	1.65
Gwoza	2	1.65	0.35	0.12	0.07
Hawul	1	1.65	0.65	0.42	0.26
Jere	4	1.60	2.40	5.76	3.60
Kaga	1	1.62	0.62	0.38	0.23
Kala-Balge	1	1.67	0.67	0.45	0.27
Konduga	1	1.65	0.65	0.42	0.26
Kukawa	1	1.65	0.65	0.42	0.26
K / Kusar	1	1.67	0.67	0.45	0.27
Mafa	0	1.65	1.65	2.72	1.65
Magumeri	1	1.60	0.60	0.36	0.23

Maiduguri	7	1.69	5.31	28.20	16.69
Marte	1	1.65	0.65	0.42	0.26
Mobbar	1	1.67	0.67	0.45	0.27
Monguno	2	1.67	0.33	0.11	0.07
Ngala	1	1.62	0.62	0.38	0.23
Ngazi	1	1.65	0.65	0.42	0.26
Shani	1	1.65	0.65	0.42	0.26
Total					**39.09**

Source: Field Survey October, 2007

Note: O = Observed Frequency

E = Expected Frequency

Chi- square calculations for kerosene

Location	O	E	O-E	$(O-E)^2$	$\frac{(O-E)^2}{E}$
Abadam	28	20.51	7.49	56.10	2.74
Askira/Uba	20	18.73	1.27	1.61	0.09
Bama	24	19.92	4.08	16.65	0.84
Bayo	28	21.41	6.59	43.43	2.03
Biu	30	21.70	8.30	68.89	3.17
Chibok	18	21.11	3.11	9.67	0.46
Damboa	19	20.51	1.51	2.28	0.11
Dikwa	20	21.41	1.41	1.99	0.09
Gubio	21	21.41	0.41	0.17	0.01
Guzamala	26	21.41	4.59	21.07	0.98
Gwoza	21	21.41	0.41	0.17	0.01
Hawul	20	21.41	1.41	1.99	0.09
Jere	27	20.81	6.19	38.32	1.84
Kaga	21	21.11	0.11	0.01	0
Kala-Balge	19	21.70	2.70	7.29	0.34
Konduga	20	21.41	1.41	1.99	0.09
Kukawa	18	21.41	3.41	11.63	0.54
K / Kusar	21	21.70	0.70	0.49	0.02
Mafa	20	21.41	1.41	1.99	0.09
Magumeri	20	20.81	0.81	0.66	0.03

Maiduguri	32	22	10	100	4.55
Marte	19	21.41	2.41	5.81	0.27
Mobbar	16	21.70	5.70	32.49	1.50
Monguno	14	21.70	7.70	59.29	2.73
Ngala	17	21.11	4.11	16.89	0.80
Ngazi	15	21.11	6.41	41.09	1.92
Shani	18	21.41	3.41	11.63	0.54
Total					**25.88**

Source: Field Survey October, 2007

Note: O = Observed frequency

E = Expected frequency

Chi- square calculations for biomass (fuelwood)

Location	O	E	O-E	$(O-E)^2$	$\frac{(O-E)^2}{E}$
Abadam	36	44.18	8.18	66.91	1.51
Askira/Uba	38	40.34	2.34	5.48	0.14
Bama	35	42.90	7.90	62.41	1.45
Bayo	40	46.10	6.1	37.21	0.81
Biu	34	46.74	12.74	162.31	3.47
Chibok	49	45.46	3.54	12.53	0.28
Damboa	47	44.18	2.82	7.95	0.18
Dikwa	48	46.10	1.90	3.61	0.08
Gubio	49	46.10	2.90	8.41	0.18
Guzamala	44	46.10	2.10	4.41	0.10
Gwoza	45	46.10	1.10	1.21	0.03
Hawul	50	46.10	3.90	15.21	0.33
Jere	36	44.82	8.82	77.79	1.74
Kaga	46	45.46	0.54	0.29	0
Kala-Balge	50	46.74	3.26	10.63	0.23
Konduga	49	46.10	2.90	8.41	0.18
Kukawa	50	46.10	3.90	15.21	0.33
K / Kusar	49	46.74	2.26	5.11	0.11
Mafa	51	46.10	4.90	24.01	0.52
Magumeri	46	44.82	1.18	1.39	0.03

Maiduguri	31	47.38	16.38	268.30	5.66
Marte	50	46.10	3.90	15.21	0.33
Mobbar	52	46.74	5.26	27.67	0.59
Monguno	53	46.74	6.26	39.19	0.84
Ngala	50	45.46	4.54	20.61	0.45
Ngazi	53	46.10	6.90	47.61	1.03
Shani	51	46.10	4.90	24.01	0.52
Total					**21.12**

Source: Field Survey October, 2007

Note: O = Observed frequency

E = Expected frequency

Chi- square calculations for others- specify

Location	O	E	O-E	$(O-E)^2$	$\frac{(O-E)^2}{E}$
Abadam	4	2.01	1.99	3.96	1.97
Askira/Uba	2	1.83	0.17	0.03	0.02
Bama	1	1.95	0.95	0.90	0.46
Bayo	3	2.10	0.90	0.81	0.39
Biu	1	2.12	1.12	1.25	0.59
Chibok	2	2.07	0.07	0	0
Damboa	1	2.01	1.01	1.02	0.51
Dikwa	2	2.10	0.10	0.01	0
Gubio	1	2.10	1.10	1.21	0.58
Guzamala	2	2.10	0.10	0.01	0
Gwoza	3	2.10	0.90	0.81	0.39
Hawul	1	2.10	1.10	1.21	0.58
Jere	1	2.04	1.04	1.08	0.53
Kaga	2	2.07	0.07	0	0
Kala-Balge	3	2.12	0.88	0.77	0.36
Konduga	2	2.10	0.10	0.01	0
Kukawa	3	2.10	0.90	0.81	0.39
K / Kusar	2	2.12	0.12	0.01	0
Mafa	1	2.10	1.10	1.21	0.58
Magumeri	2	2.04	0.04	0	0

Maiduguri	1	2.15	1.15	1.32	0.61
Marte	2	2.10	0.10	0.01	0
Mobbar	4	2.12	1.88	3.53	1.67
Monguno	3	2.12	0.88	0.77	0.36
Ngala	2	2.07	0.07	0	0
Ngazi	3	2.10	0.90	0.81	0.39
Shani	2	2.10	0.10	0.01	0
Total					**10.38**

Source: Field Survey October, 2007

Note: O = Observed frequency

E = Expected frequency

Chi-square calculation:

$$X^2 = \sum \frac{(O - E)^2}{E}$$

Chi- square calculation for electricity

= 34.06

Chi- square calculation for gas (domestic cooking gas)

= 39.09

Chi- square calculation for kerosene

= 25.88

Chi- square calculation for biomass (fuelwood)

= 21.12

Chi- square calculation for others-specify

= 10.38

Thus, 34.06 + 39.09 + 25.88 + 21.12 + 10.39 = 130.54

Degree of freedom (df)

R = Rows

C = Column

df = (R - 1) (C- 1)

= (27 - 1) (5- 1)

= (26) (4) = 104

Testing the Hypothesis at 5% Level of Significance by using mathematics Statistical and Formulae table.

Decision Rule: Reject H_O if calculated value is greater than tabulated value.

Chi – square calculated value = 130.54

Tabulated value = 104

Since calculated value is greater than the tabulated value, then we reject H_O. This means that environmental concern and management approaches do not form a part of rural communities concern.