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ETHNOGRAPHIC SOURCES OF ENERGY IN BAYOMEN-CAMEROON

Lucy Fonjong Udikoh[1,*] and Basil Ndikaka Ngala[2]

[1]Senior Lecturer, Faculty of Arts, Letters and Social Sci., Anthropology Dept., Yaoundé I Univ., **Cameroon.**
[2]Anthropology of Development, Anthropology Dept., Yaoundé I Univ., **Cameroon.**

[*]**Corresponding author:**basilngalandikaka@gmail.com **Received:** 14 Feb. 2022 **; Accepted:** 10 April 2022

ABSTRACT: The inhabitants of Bayomen village have been provided with a renewable source of energy that is solar, not all the inhabitants of this village are using this new source of energy because of the problem of low voltage. This study seeks to explain the ethnography of the different energy power in Bayomen village. Methodologically, we used qualitative data collection and analysis. Techniques used for data collection were; in-depth interviews, focus group discussions and photographs were explored. Our findings reveal that before the inhabitants of Bayomen village were using wood fuel, generators, and lamps for either lighting, heating, and for cooking before they were provided with solar. They have been switching from one energy source to another, starting with wood fuel, fire stick lighter, locally made tin lamps, touches, generators, small solar plates. A concentrated solar system has been installed, which seems to be the largest energy source in Bayomen village to date. It is the source of energy that a majority of the population of this community is using. We also noticed that the inhabitants of Bayomen village have been switching from one source of energy to another because they are searching for that energy that will fulfill their aspirations. To improve the quality and quantity of the present concentrated solar system, the inhabitants of Bayomen village are using today, they should extend the plates and equally add the batteries to ensure that enough sunlight is absorbed and converted into current, which will eventually be supplied to everyone in the village. The coming of solar energy to Bayomen has alleviated poverty amongst the inhabitants earning a living. Some inhabitants have become technicians, repairers, provisional store owners. Consequently, the introduction of solar energy in the village has made people gain the status of a business centre in the Kon-Yambettar Subdivision. The population of Bayomen has doubled recently, with the advent of solar energy with people migrating from other communities to come and settle there. Another area of research could be conducted on the representations of sources of energy in Bayomen-Cameroon.

Key words: Ethnography, Sources, Energy, Bayomen and Cameroon.

INTRODUCTION

Africa is endowed with a diversity of energy resources unevenly located across the continent. They include relatively essential reserves of oil, gas, and coal that account for 9.4%, 7.9%, and 5.54%, respectively, of the total world energy. Hydropower potential of the continent amounts to 13% of the world. In Africa, energy is produced mainly from biomass (47%), oil (24.8%), coal (16.5%), gas (10.4%), and other renewable sources, such as large and small hydro damps, solar, and geothermal sources (1.3%) 2. The African continent has abundant solar radiation ranging from 5 to 7 KWh/m^2 all year round, and it enjoys a relatively strong wind power potential in Northern, Southern, and Eastern Africa. The African continent has an estimated geothermal energy potential of 9,000 MW in the Rift Valley area in East Africa.

Emerging disciplines such as the Energy Humanities, **Szeman and Boyer (2017)** are currently showing the need to overcome strict scientific boundaries to grasp the complexity of the current socio-economic and ecological transition at

multiple geographical scales. It is in this framework that recent studies on energy ethnography have taken place, **Smith and High (2017); Goodman (2018)**. Mainly with the aim to shed light on the social and material dimensions of apparently invisible energy infrastructures, a few studies adopted an ethnographic approach to research on energy production places, **Bougleux (2012)**, be it traditional workplaces such as thermoelectric (or nuclear) power stations or more recently renewable energy power plants and territories, probably due to the difficulty of accessing the field. Several types research engaged with the ethnography of energy consumption, investigating values, practices, and habits of the end-users **Strauss *et al.* (2013)**. At the same time, others paid more attention to the impacts on the everyday life of mineral extraction and energy production, especially in the Global South **Sawyer (2014), Howe and Boyer (2016)**.

Context

Solar energy is a type of renewable energy which is best for the environment because it is the cleanest and most abundant renewable energy source available. So, what is there that should not be appreciated like any technology. Solar comes with its pros and cons. Whether it is commercial or residential systems, (GENI), the different types of solar energy include; photovoltaic solar energy, concentrated solar energy, Water heater solar energy, Solar pool heat, and Thermal solar energy. The usage of these different sources of energy around the world has been helping its consumers to meet up their energy requirements. Here is a growing under-provision of investment in grid-electricity and telecommunication facilities in rural areas of most developing countries **(Economic Commission for Africa, 2004)**. Solar PV provides alternative power to meet the information and communication needs of off-grid rural and peri-urban communities. By powering radios, televisions, and computers with solar PV, rural households can access health, education, business, agricultural and environmental information to better their standard of living **(Greenstar, 2004; Amankwaah, 2005)**. Internet-connected community centers and rural business centers are emerging areas where solar PV is used to power the equipment to deliver information and communication technology (ICT) services in rural and peri-urban communities in Ghana.

Cameroon is estimated to have around 27 million inhabitants and a GDP per capita of 1,250 USD (Table 8.1). Access to electricity in 2015 only amounted to 55% of the population, with rural regions registering access levels as low as 20%. Cameroon has the second most abundant hydroelectricity potential on the continent, and hydro already accounts for more than two-thirds of its total energy production. The grid infrastructure is in poor condition, and hydroelectricity is subject to water level fluctuations, which has led officials to shift their gaze towards a steady energy source: solar power. Besides the expansion of hydroelectricity, Cameroon is also implementing regulations that will favour the use of solar energy. Cameroon offers favorable conditions for solar station's applications, especially in its Northern regions, where irradiation levels can reach up to 5.8 KWh/day/m^2.

Cameroon annually produces approximately 1475 MW of electricity. Out of the total energy produced, hydroelectricity is the most common source, amounting to more than 70% of the total production. Two main hydro stations of the country are both located on the Sananga river. Due to Cameroon's high dependence on hydro energy, and the hydro stations dependency on the same river, the government is heavily affected by droughts and water level fluctuations. The other prevalent energy source is fossil fuel-powered: approximately 30 aging diesel power stations serve as a backup solution.

Under the long-term energy sector development plan (PDSE 2030) and the poverty reduction strategy paper (PRSP), the country is seeking to leave its under-developed status behind. To achieve this, investment in the energy sector is inevitable. Cameroon is making a move towards expanding renewable energy sources to diversify its energy portfolio. These ambitions are aided by the objectives laid down under Vision 2035. The policy aims at increasing production and delivering electricity with an emphasis on renewable energy. Besides this policy, Cameroon is creating a new legal framework for renewable energy. The framework will cover promotional, legal, and financial operation matters of implementing renewable energy sources. Even though such a framework is in its initial phases, David Payang of the Ministry of Environment has confirmed that a committee has been put in place to write a draft law.

In 2011, the Ministry of Finance exempted solar panels from value-added tax. This exemption eased solar power consumers of 19.25% of their tax and has contributed significantly to expanding solar systems in the Cameroonian residential area. According to the Ministry of Mines, Water, and Energy, over 12% of Cameroon homes run on solar energy predominantly in the urban areas. Cameroon also puts a big emphasis on the electrification of its rural areas in its Rural Electrification Master Plan. This initiative aims at providing Six hundred and sixty localities by extension of interconnected grids and rehabilitation of already existing energy sources. By 2020, the government aspired to reach electrification rates of 48% countrywide, with 75% in urban areas and 20% in rural ones. However, in Bayomen, we observed that even though electricity has been provided to them in the form of renewable energy, not all homes are electrified with this source of energy either because of the financial constrains associated with electrification or simply resistance caused by the challenges involved with the innovative source energy.

METHODOLOGY

We deployed the qualitative research methodology, which allows the researcher to capture the meanings in individuals' lives as **Lincoln and Denzin (2000: 3)**. We discovered the meaning in a specific socio-cultural setting **Neuman (2011: 174)**, which is therefore appropriate. Quantitative research measures attitudes, opinions, behaviours, and other defined variables. It generalizes results from a larger sample population as stated by **Given (2000)**, therefore, in seeking to amplify the understanding about the ethnography of sources of energy in the Bayomen village. We used qualitative techniques for data collection like Focus Group Discussion, In-depth interview, direct observation, and photographs. This involves investigating the evolution of energy sources over time in their cultural context. We employed purposive sampling and snowball sampling techniques to gather data for our study. Purposive sampling was focalized, which involves choosing informants who can offer closely guarded information, because not all members of the village could give the required information. The aim was to include those who were knowledgeable about the town and had something to say concerning dynamics in sources of energy in the town (for at least two years). A total of 50 informants, 29 men and 21women, were involved in the study.

In-depth semi-structured interviews were conducted to collect data. This is an appropriate way to find out what people feel and think about their world **Rubin and Rubin (2000)**. We organized one focus group discussion with informants coming from diverse backgrounds and the different regions of the country. Their voice was recorded from the interview and focus group discussions. One focus group discussion was organized between users and non-users of solar energy, and it was made up of youths and the old. This focus group discussion was composed of four men and four women, giving eight participants. Free listing was capitalized to get their standpoint on the ethnography of energy sources in Bayomen village.

Content Analysis

This study will bring out a clear distinction of separating analyses from interpretation. Our research will be based purely on the emic approach or the native point of view. According to **Mbonji (2005)**, an investigation is based on resolutions, discoveries of answers, and the clearance for solutions by the combination of elements of a problem.

Presentation of Research area

Bayomen is one of the twelve villages found under the Kon-Yambettar subdivision in the Centre Region of Cameroon. It is Located around Bafia along the national route No 4, which is the road linking Bafoussam and Yaoundé; some 75miles (120km) North-West of Yaoundé. Bayomen is one of the villages under the Mbam and Inoubou division found in the Centre Region of Cameroon. It is situated about 148km from Yaoundé. Bayomen shares a boundary with the following villages; to the East by Bamoko, to the South by Kon and Dii, to the West by Babetta, and finally to the North by Deuk, the surface area of Bayomen is approximately 534m. The population of Bayomen is estimated to be 800 inhabitants, coming from different cultural backgrounds and regions.

Solar energy is a type of renewable energy which is best for the environment, so what is there that should not be loved about it? Of course, like any technology, solar comes with its pros and cons. The latter usually have a capacity of a 10–130 watts peak (up to a 250 watts peak has been installed in some households) **Lysen (2013); Pachauri (2013)**

and Rolland (2011). It has been estimated that worldwide, there are about six million SHS installed today types of research (and, as compared to 1.3 million procedures in 2002), although significant data gaps only allow for indicative numbers, **IRENA (2015)**.

Ethnographies of energy production in times of transition

Emerging disciplines such as the Energy Humanities **Szeman and Boyer (2017)** are currently showing the need to overcome strict scientific boundaries to grasp the complexity of the current socio-economic and ecological transition at multiple geographical scales. It is in this framework that recent studies on energy ethnography have taken place, **Smith and High (2017)**; Goodman (2018), mainly with the aim to shed light on the social and material dimensions of apparently invisible energy infrastructures. Few types of research adopted an ethnographic approach to research on energy production places **Bougleux (2012)**, be it traditional workplaces such as thermoelectric (or nuclear) power stations or more recently renewable energy power plants and territories, probably due to the difficulty of accessing the field. Types of research engaged with the ethnography of energy consumption, investigating values, practices, and habits of the end-users Strauss et al. (2013), while others paid more attention to the impacts on the everyday life of mineral extraction and energy production, especially in the Global South, **Sawyer (2014); Howe and Boyer (2016)**.

Lately, emerging research is tackling the EU's decarburization strategy and mitigation of climate change through investigating the transition to renewable energies. The Saharan desert of North Africa is perceived as a vast untapped supply of nearby renewable energy. North African countries are highly interested in energy transitions to renewable for both domestic use and export. There is not much research around large-scale renewable energy production schemes, and only a few studies mention issues of land ownership and the presence of communities in these areas, **Rignall (2016)**.

More empirical research and ethnographic works are needed to focus on culture, power, social relations, and the people's lived experiences in and around energy production plants. Ethnography is crucial so to bring to the fore elements such as gender differences and other less visible power relations in the context of the study. It also helps to contextualize the ontological positions and subjectivities of people and gives local meaning connected to technology, society, and environment. This paper invites either ethnographic or qualitative contributions that deal with themes around energy transition and climate justice, highlighting aspects related to communities around renewable and traditional energy production plants, issues of land enclosures, manufacturing processes, local participation for just energy production and transfer.

RESULTS

From the extracts of the 50 users/none of the solar energy surveyed, the inhabitants of Bayomen village have come across eight different sources of energy till date starting with: Wood fuel, Fire stick lighter, locally made tin lamp, Hurricane lamps (Bush lamps), a touch, a generator, a small solar plate, and a light and finally with a Concentrated solar system which they have come in contact with over the years.

Wood fuel

Wood fuel is one of the oldest, and sources of energy that the inhabitants of Bayomen village have been using for cooking, heating, and home lighting. Wood fuel is considered the best because it is cheap and elementary to use by everyone. It is regarded as the oldest source of energy because almost all the communities in Cameroon have come across it, and it is still used despite the availability of other new sources of energy. Wood fuel is very easy to set up because it requires dry wood, a match, and three stones. All these resources are highly abundant in all communities not living out Bayomen. To add, this source of energy can be set up anywhere, be it in front or at the back of the house. When the fuel wood is consumed, there is a need to replace it with another to ensure that the heat is maintained. This energy source is usually used in drying, heating, and home lighting. In the past, wood fuel was a socializing factor as it usually brought together family members to rally beside the fire site to keep themselves warm. Here, they used to tell stories, and sayings from the parents to the children, and this has always been done from generation to generation. This wood fuel fire site is considered to be one of the best sources because it gives the food prepared a good taste. The disadvantage with this source is dirty and destroys other houses and other materials.

Picture 1. Showing a wood fuel fire site

Source: Fieldwork, July 2019.

Looking at the picture above, we can see a three-stone fire site. On the three-stone fire site is a pot. There is a fire burning under the pot, and the smoke is being produced, meaning that there is something coking on the fire. In this same picture, wood is used as fuel. When it burns, it produces heat that permits whatsoever that is placed on it to get ready. Wood can be set up anywhere irrespective of the site.

Firelight

In those days, the inhabitants of Bayomen village used to face the problem of lighting themselves during dark hours. Even though they had the three-stone fire site, it was limited to the immediate surroundings. So, there was a need for the flame of the fire to be moved about from the three-fire stone to another destination or faced with the problem of darkness. The firelight was made up of a bundle of split little sticks of wood to permits it to burn and produce a flame, which along could be used as light during the night. Apart from using it for home lighting, the inhabitants of Bayomen village used it to light up themselves whenever they were to cover long distances at night. In addition, the flame and light produced by this fire stick often chased and scared away wild animals from harming them. Since the inhabitants of Bayomen were living in a forest zone, the fire stick was a source of protection. It also helped neighbours share fire and light up their three-side firestones and homes. It is suitable for lighting but very dangerous, as it can cause fire accidents easily.

Picture 2. Showing a fire stick lighter

Source: Fieldwork, July 2019.

The picture above shows us fire burning and the flame moving up, and this is what the inhabitants used to light up themselves during night hours. This picture shows us that with a fire stick, fire can be transported from one household to another either for lighting, heating or cooking.

Locally made tin lamp

As time passed by, things changed, and Bayomen village was not left out. The inhabitants of Bayomen started thinking about modifying fire as their source of energy for home lighting to better their living conditions. With this idea in mind, they fabricated a local tin lamp using metals like zinc and aluminum. These locally made tins use kerosene as fuel to function. This locally made container usually had a lead and on this lead was a small hole that could permit a rope to pass freely. The tip of this tin lamp was often taken off from time to time to either increase kerosene or maybe change the string when the need arose. When the rope absorbed the kerosene, it lighted and produced flames. It was beneficial to the inhabitants because it was moveable from one place to another with ease. The locally made tins lamp in Bayomen village replaced the fire stick. This source of energy was used just for home lighting during the night and whenever the inhabitants of Bayomen village were to make night movements from one place to another, since this area was a thick forest. The flame of the tin lamp could cover a large spectrum, which permitted the inhabitants to carry out their evening activities without any problem. The locally made tin lamp needs fuel and a string to function. Even if they got exhausted, there was a needed to replace them. Wind could be a significant hindrance since it didn't have a lead to cover the flame from quenching.

Picture 3. Showing a locally made Tin lamp

Source: Fieldwork, July 2019.

The picture above shows us a locally made lamp fabricated out of metals that take a string and kerosene to burn and produce a flame. It is the energy source that the inhabitants of Bayomen village used, which replaced fire sticks lighter. It was used for home lighting, lighting up themselves whenever they wanted to move far or near from their homes during the night.

Hurricane lamps (Bush lamps)

The hurricane lamp was another source of energy that has been used in the Bayomen village. The advent of the hurricane lamps, replaced the locally made tin lamps. The hurricane lamp was a kind of modification of the locally made tin lamp. The hurricane lamp is different from the locally made tin lamp in that it has well-designed handle and glass to protect wind from quenching the flame, and also ensures that the light from the lamp should be spread far beyond the lamp. The glass was usually removed from time to time for cleaning and replaced immediately to prevent it from breaking. It used kerosene as fuel to permit the rope to absorb kerosene which, when lighted, will burn, and produce small flames of fire. It is one of the oldest sources of energy that the inhabitants of Bayomen village have been using for years, and some are still having even though not using it, and it also made the house worm. It can light up a vast area simultaneously. It brings smoke into the house.

Picture 4. Showing a hurricane lamp (Bush lamp)

Source: Fieldwork, July 2019.

According to the picture above, the hurricane lamp is being lighted and a flame is produced with light which helps the inhabitants for home lighting and around them in case they have to make night movements.

A Touch

The Bayomen village also used touches as a source of energy for home lighting, and in case they were to make night movements. Touches were using batteries to function. These batteries were often replaced whenever they expire. These touches were made of metal materials and others from plastics that could be repair easily if it gets bad. With these touches, the inhabitants of the Bayomen village could carry out any kind of activity during night hours. The effects of the touch could be felt from a distance, and it permitted them to see in the night with ease. It is moveable which allow you to see from a distance. The challenge with touch is if it gets terrible, repairing it becomes a night mere.

Picture 5. Showing a pair of touch

Source: Fieldwork, July 2019.

The picture above shows us a pair of metal touches that uses batteries that the inhabitants of Bayomen community used to light up themselves or their homes during night hours. The light from these touches usually permitted the inhabitants to see well at night.

A Generator

With the improvements in technology, generators came into existence and became very popular and highly used. Generators came to the Bayomen village as one of the most significant energy sources that the inhabitants had ever had. The presence of generators gave the inhabitants of Bayomen village hopes as it could light up a few houses simultaneously. These generators were using petrol as fuel, usually filled whenever the tank was empty. The coming of generators in Bayomen dominated the other energy sources like wood fuel, and fire sticks, lighter locally made tin lamps, and touches. These generators were used for lighting and heating. It has been beneficial during the celebrations, funeral ceremonies, and festivals. The introduction of generators in Bayomen village permitted the inhabitants to purchase cell phones that could be charged through generators. The problem they faced with these generators was that they were costly and as such only a few people could afford them. This explains why it was scare in those days in Bayomen village. To add there was also the issue of fueling, for it to function. With generators, the inhabitants of Bayomen village had the opportunity to use some home appliances like TV sets, radio set. It could light up a few houses in a neighborhood, and it consumed less fuel, encouraging so many users. Generators were known for causing noise and air pollution, which could be detrimental to human beings.

Picture 6. Showing a Generator

Source: Fieldwork, July 2019.

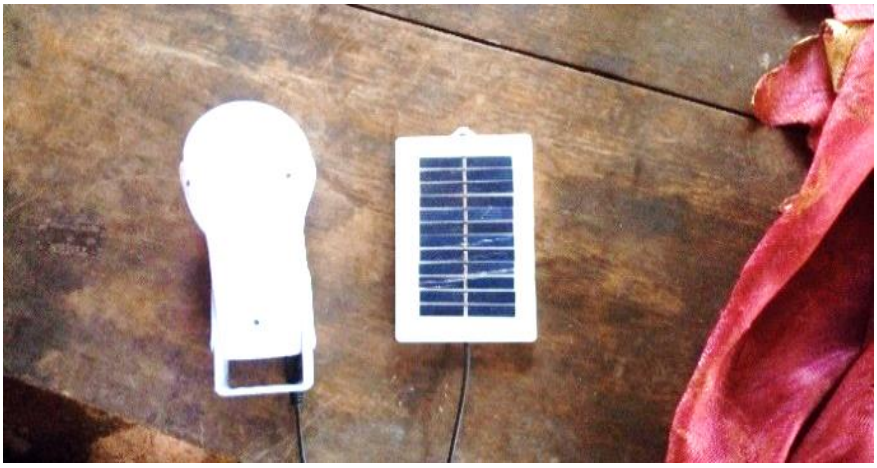
The picture above shows us a generator which was one of the sources of energy used by the inhabitants of Bayomen village. The inhabitants of Bayomen used it for home lighting and other appliances like TV sets, radios, charging of phones, just to name a few that could be connected to it. These generators used petrol to function. When steamed, it produced electricity that could supply the whole house and be distributed to a few neighbours.

A Small solar plate and a lamp

Recently, small solar lamps were being introduced in Bayomen village. This energy source was used by almost everyone, with reasons being that it was very economical, as the inhabitants didn't have to feel it but rather placed it out of their homes to absorb direct sunlight, which eventually transformed this natural light into current. These small solar lamps were beneficial as they were portable and could be used for home lighting and charging of phones. The small solar plate if well charged, could last for hours before it went off. These small solar plate lamps are fabricated with plastic which permits them to stay for a long time and can also withstand harsh weather conditions, and they are still in use today in Bayomen village because it is not everybody that has subscribed to the full solar plates installed in Bayomen village. This

energy source is potable and can light up the house for a long time before extinguishing; hence it is cheaper and more economical. They are fragile and need to be handled with care because once it gets bad, it is not helpful again.

Picture 7. Showing a small solar plate and a Lamp



Source: Fieldwork, July 2019.

The picture above shows a small solar plate and a lamp. This is one of the energy sources that the inhabitants of Bayomen village are using today for home lighting and charging phones. With this source of energy, you just need to place it outside to absorb direct sunlight, which is eventually converted into current and used by the inhabitants either for home lighting or charging of phones during the day and at night.

Concentrated Solar System

This energy source was installed in Bayomen in 2017 by a Chinese company, and they have been using it till the present. It was a result of a deal that the government of Cameroon signed with a Chinese company Huawei. They agreed to construct this project and control it for some time, and later handed it over to the Cameroonian government for control and ownership. The solar energy project is seen by the inhabitants as a gigantic one. Some have even called it one of a kind because it is the first time they are using energy of that magnitude. Here, solar plates have been installed in vast areas and electricity is distributed to the whole village. In addition, there is a small room that contains batteries where direct light is absorbed and stored before being converted into electricity, which is later distributed to its consumers. It is one of the most significant energy sources that the inhabitants of Bayomen village have come in contact with. The reason is simple, it operates any kind of appliance. Also, it has diverse and multiple functions that each consumer could exploit at the same time. The introduction of solar energy in Bayomen village has made so many inhabitants to shift from other sources of energy like wood fuel, bush lamps, generators, and touches, locally made tin lamps, and small solar lamps to this concentrated solar system. The introduction of solar energy in Bayomen town has rapidly transformed the village into a business center, pulling people from neighboring villages to come and buy or sell farm products. It is terrific and environmentally friendly, it can light up the whole community accelerating economic development. So many people are leaving neighbouring villages and other parts of the country to come and exploit this energy to make a living for themselves. One of the major problems faced by users of the concentrated solar system is recharging when there is a poor network, hence doubled payments may occur.

Picture 8. Showing Concentrated Solar System

Source: Fieldwork, August 2019.

Looking the picture above, solar plates, have been installed in a vast area to ensure the electrification of Bayomen village. In between the solar containers, is the researcher who was granted the opportunity to enter and view of the installation site and see how they function. The small room behind is where the batteries have been stored, when the plates trap direct sunlight, they are stored in these batteries before being converted into electricity, which is then distributed to solar energy users.

DISCUSSION

Bayomen village, like any other village in Cameroon, has been in the dark for some years without electricity until the government had to partner with a Chinese company called Huawei, and electricity was provided through a concentrated solar system. Before the introduction of solar energy in Bayomen village, the indigenes have been using some traditional sources for heating, cooking, and lighting, starting with wood fuel, fire-sticks, locally made tin lamps, hurricane lamps, touch, and finally to a concentrated solar system which they have been using up till date. The reason behind the switching from one energy source to another is that these sources of energy have failed to yield the common aspirations of the users. In a nutshell, as time evolved, the needs of the indigenes of Bayomen kept increasing with the challenges of civilization and modernity. That is why they have been changing from one energy source to another to solve their immediate problems whenever they surface. The arrival of solar power has rapidly transformed the area, for it has alleviated poverty among its inhabitants. It has facilitated interaction and the exchange of goods and services within the village and the neighbouring villages. One reason why solar energy is outstanding is that it has multiple and advanced functions than the other sources of energy that the inhabitants of Bayomen have been using in the past. Hence, a good number of our informants who are electrified with this solar energy made us understand that it is of low capacity, especially when you switch-heavy appliances or machines like welding machines, sewing machines, mortising machines, and processing. This has pushed some of them to request another energy source like hydroelectric power or wind energy to complement this one. The disadvantage with the changes in sources of energy has been pushing some inhabitants to resist the innovative one, either because of the cost of adaptation or its challenges.

CONCLUSION

Energy is one of those resources that the indigenes of Bayomen have been anxiously waiting and eager to have after spending years in darkness. It was discovered that the inhabitants of Bayomen village have been switching from one energy source to another, starting with wood fuel, fire stick, locally made tin lamp, hurricane lamp, touch, and finally to a full solar system which they have been using up till date. Solar power has come to help the inhabitants meet up

with their needs. That is why it has improved the living conditions of its inhabitants. It has pulled people from neighbouring villages and also from different regions of Cameroon to come and establish and earn a living. Solar energy is the most significant source of energy that the inhabitants of Bayomen have come across, and it is capable of electrifying the whole village. The lives of the inhabitants of Bayomen have changed thanks to the introduction of solar energy in their town. The advent of solar energy has brought development to Bayomen, making the village gain the status of a town under Kon-Yambettar. Another area of research could be on the representations of energy sources in Bayomen-Cameroon.

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RESEARCH ARTICLE

Ethnographic Sources of Energy in Bayomen-Cameroon

Authors' contributions

Author details: Lucy F. Udikoh and Basil N. Ngala, Anthropology Dept., Yaoundé I Univ., **Cameroon**

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Competing interests

The authors declare that they have no competing interests.

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