Original Research Article

Impact of Electricity Service on Performance of Microenterprises of Rural Entrepreneurs in Ogun State, Nigeria

ABSTRACT

The expansion of microenterprises in rural areas is linked with the increase in access and use of electricity services, leading to changes income. However, there is little empirical evidence to underpin the mechanisms that lead from energy supply to profit generation among rural entrepreneurs. To this end, this study analyzed the impact of electricity service on performance of microenterprises of rural entrepreneurs. Primary data were used for this study. Data were collected using questionnaires from a sample of 150 rural entrepreneurs engaged in various microenterprise economic activities from Odeda Local Government Areas of Ogun State in a three-stage sampling procedure. The data collected were analyzed using descriptive statistics, logit model and ordinary regression analysis. The result shows that hair dressing and retail shop were the most common form of businesses followed by grain milling, tailoring, welding, relaxation sports centre and cassava processing. In addition, the result reveals that age, years of schooling, nature of business, monthly expenditure on alternative source of power and duration of power outage supported the microenterprise owner decisions to connect to grid electricity service. Also power outage duration and billing method negatively affected firms' profitability. On other hand durations of power supply and expenditure on alternative power supply significantly has a positive impact on the profitability of microenterprise. The study therefore recommends that government should intensify action in providing rural communities with reliable and affordable electricity services.

Keywords: Electricity, Rural, Entrepreneur, Microenterprise, Performance

1. INTRODUCTION

Microenterprises are important and productive economic unit components of the Nigerian economy, comprising a significant proportion of the country's informal sector operating in rural and urban areas. The enterprises contribute significantly to a country's gross domestic product (GDP) through the consolidation and mobilization of scarce resources to the needs and demands of fragmented domestic markets (Kirubi, 2006). Microenterprises are growth supporting sectors that not only contribute significantly to improve living standards, but also bring substantial local capital formation and are responsible for driving innovation and competition in developing economies. Governments at all levels have undertaken initiatives to promote the growth and development of micro, small and medium enterprises. They also believe that unlocking the key potential of this sector also involves the provision of regular and affordable power supply (Smedan and NBS, 2013).

Rural energy occupies centre-stage in rural development issues. Energy is crucial for enterprises. It drives economic and social development by increasing productivity, incomes, and employment; reducing workloads and freeing up time for other activities; and facilitating the availability of higher-quality or lower-priced products through local production (Ana and Ramy, 2015). Electricity use in rural areas can be categorized as household electricity, electricity for agriculture and electricity for small and medium enterprises (Karekezi and Kithyoma, 2002). Energy inputs such as electricity and fuels are essential to generate jobs, industrial activities, transportation, commerce, micro-enterprises and agriculture outputs. (UN-Energy, 2005).

Electricity is an important input for many energy services in enterprise operation, and therefore access to electricity and its price play a role in the viability and profitability of the enterprise. However, in Nigeria there has been a prolonged public outcry over the continuous increase in the unit price of electricity, which many believe is not in tandem with the current realities in electricity supply. The tariff has continued to increase from an average of ₦10 per kw/h in 2007 to an average of ₦24.20 kw/h in 2017 without substantial improvement in power supply (Onojake,2018). If the energy supply does not come together with income generation opportunities there is in fact a poverty trap: poor people cannot get enough income to pay for energy access which in turn keeps their productivity low, making energy access unaffordable (IDS, 2003). One of the policy measures that developing countries are currently pursuing in a bid to enhance growth and expansion of microenterprise is electrification of rural areas.

Governments have supported the development of rural electrification programmes on their own or through partnership with private electricity utility firms as a way of providing energy to rural areas. Such programmes have huge potential benefits because the availability of electricity and other basic amenities can increase the productivity and profitability of existing micro-enterprises, and also reduce the barrier to the creation of new micro-enterprises (Kooijman-van Dijk & Clancy, 2010) which in-turn may increase the available disposable income that may be used to improve the standard of living. Despite the substantial progress made towards the realization of sustainable development poor rural electricity supply attests to the window dressing nature of many rural electrification projects and lack of strong political will to offer permanent solution (Oyekale, 2012). Connectivity to grid electricity services, coupled with its availability, accessibility, affordability is still a major challenge. Without available and reliable electricity services there is no possibility of utilizing modern electrical appliances.

In light of the above, there is little empirical evidence to underpin the mechanisms that lead from energy supply to profit generation among rural entrepreneurs, and insights are lacking into which factors would contribute to improving the impacts of electricity uses on performance. This paper contributes to filling the knowledge gap on access to electricity and performance of microenterprise. This study therefore identifies the types of microenterprise activities practiced by rural entrepreneurs, examine the determinants of connection to grid-electricity by rural entrepreneurs and analyse the effect of electricity service on profitability of microenterprise by rural entrepreneurs.

2. LITERATURE REVIEW

Energy is a prerequisite for proper functioning of nearly all sub-sectors of the economy. It is an essential service, whose availability and quality determines success or failure of development endeavours (URT, 2003). This argument is valid particularly when we consider supply of energy to small and large firms/businesses dealing with service provision and manufacturing, where power is used as an input in the operations/production process rather than a final consumption service. Hence, a temporary stoppage of power can lead to relative

chaos. While a loss of power in smaller scale settings may not be life threatening but can result in lost data, missed deadlines, decrease in productivity or loss of revenue.

Maleko (2005) carried out a study in Tanzania and sought to find out the effect of adoption of electricity on the performance of microenterprises. Result revealed that the growth rates of microenterprises were noticeably higher in areas with electricity services than in areas without electricity services, but the proportion was low compared to microenterprises growth rate and time of electricity introduction. Also enterprise owners and employees were found to increase their financial and physical assets from earnings and savings obtained from use of grid electricity services in their enterprises. Other benefits they gained were business knowledge, skills and experience after being involved in business activities. The study further revealed that there was a possibility of rapid emergence and development of micro-enterprises in rural areas of the same characteristics as Kilimanjaro region if the electricity services supplied should be available, reliable and affordable to most of rural poor.

Bose et al. (2013) evaluated the impact of electricity availability on the operation and performance of SMEs in the rural areas of Bangladesh. The study was carried out in two electrified villages in Paikgacha and Khulna. The study detected favorable changes on the production costs, profit margin, development and modernization of business, women empowerment, quality of life, and human development due to the electrification. The study revealed that with the help of electricity modern energy saves money that is cost effectiveness, easy to use, reduce operation cost of enterprises and reliable. Also after electrification women tried to start a new business such as tailoring, sewing, agriculture, hatchery, retail shops etc. And they also open their business after sunset.

Akpan et al. (2013) investigated how rural electrification through extension of existing grid has impacted rural microenterprises in the area of the Niger Delta, Nigeria. The result showed that on average, enterprises in communities connected to the electricity grid are 16.2% more profitable than enterprises in communities not connected to the grid, and the use of generating sets in providing back-up electricity makes microenterprises more profitable. The study also observed that micro-enterprise owners are fully aware of the importance of electricity access to the profitability of their businesses and those who can afford generating sets willingly do so. Also, the total expenditure on generating sets by some enterprises is up to three times the tariff for grid electricity in rural areas. The high cost of self-generated electricity increases the total cost of doing business in rural areas thus reducing the profit margin of the micro-enterprises.

Ijogu (2016) analyzed the impact of rural electrification project on agro-based and non-agro based enterprises in riverside rural communities in Cross River State, Nigeria. The results of the research revealed that the total income and net enterprise income of operators of agro-based and non-agro based enterprises with electricity increased significantly after electricity intervention and also more than that of operators in riverside rural communities without electricity. The implication of the result indicated that there was an impact of electricity on the income of operators of agro-based and non-agro based enterprises in the study area. The study therefore recommended that government should intensify action in providing riverside rural communities with electricity as this is one of the veritable tools for rural transformation.

Duru and Yusuf (2017) examined the role of electricity services on micro-enterprises establishment, growth, expansion, decline, and closure in rural Ganaja of Kogi State. The results from the study showed that electricity services had both positive and negative effects on micro-enterprises establishment, growth, expansion, decline, and closure in Ganaja village. The findings further revealed that the effect of electricity services was felt in the

opening of new businesses, expansion of existing businesses, employment of more employees, the decline in turnover, increase in income and stoppage of production or operation. The problems and barriers experienced by micro-enterprises in accessing and using electricity services were lack of service line materials such as fuses, cables, poles and transformers, complicated tariff structure such as high initial connection and installation fees and high monthly bills; illegal connection and vandalism of cables and cooling transformer oil which causes power rationing, low voltage and fluctuation. The study, therefore, recommended increase access to capital for investments in electricity generating equipment and appliances; rural electricity access projects should focus on micro-credit provision and allowing the poor to purchase direct-use electricity generating equipment and appliances.

3. METHODOLOGY

3.1 Study Area

The study was carried out in Odeda Local Government Area of Ogun State, having its headquarters town in Odeda, situated some 10 kilometers away from Abeokuta, the State capital. Odeda LGA shares boundaries with Ibarapa and Iddo Local Government Areas of Oyo state in the North and East respectively, while in the South and West by Abeokuta South and Obafemi/Owode Local Government Areas, respectively. Odeda LGA has three zones, namely: Odeda, Ilugun and Opeji zones; Odeda had 4 wards, while Opeji and Ilugun had 3 wards each to give a total of 10 wards. Odeda LGA has a landmass of 1,263.25sq. km, and a population of 109,449 based on the 2006 population census (National Bureau of Statistics, 2009).

3.1 Source of Data and Sampling Procedures

A cross-sectional primary data was collected using a structured questionnaire administered entrepreneurs engaged in various microenterprise economic activities. A multi-stage sampling technique was employed for this study. The first stage involved the selection of five wards out of the ten wards in the Local Government Area. At the second stage, two communities were randomly chosen from each selected ward giving a total number of ten communities. The last stage was purposeful selection of fifteen entrepreneurs that are engaged in various microenterprise economic activities from the selected communities making a total of 150 respondents. Thus, one hundred and fifty rural entrepreneurs were randomly selected and interviewed using structured questionnaires, but only one hundred and forty-three questionnaires were found useful and valid for the study.

3.3 Methods of Data Analysis

Descriptive statistics was used to examine the socio-economic characteristics of the rural entrepreneurs and various microenterprise activities practiced by them. The descriptive tools used include means, frequencies and percentages.

A logit model was employed in estimating factors that determine grid connectivity among rural entrepreneurs. An entrepreneur decision to get grid electricity may be influenced by socioeconomic/demographic characteristics and its community factors, including availability of electricity at the community level. The response variables were binary; taking values of 1 if enterprise owner has grid connection and 0 otherwise, while the independent variables were both continuous and discrete. Following Bogale and Shimelis (2009), the cumulative logistic probability model can be econometrically stated as:

$$P_i = F(Z_i) = \frac{1}{1 + e^{-(\alpha + \sum \beta_i X_i)}}$$

Where: P_i = the probability that the enterprise has grid electricity connection given Xi

X_i = a vector of explanatory variables

α & β = regression parameters to be estimated.

e = the base of the natural logarithm

For ease of interpretation of the coefficients, a logistic model could be written in terms of the odds and log of odd (Hosmer and Lemeshew, 1989). The odds ratio implies the ratio of the probability (P_i) that an enterprise has grid connection to the probability ($1-P_i$) that the enterprise is not grid connected

$$\frac{Pi}{1-Pi} = e^{zi}$$

Taking the natural logarithm of the equation yields:

$$\ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_m X_m$$

If the error term, ε_i is taken into account the equation becomes:

$$Z_i = \alpha + \sum_{i=0}^{m} \beta i X_i + \varepsilon_i$$

The explanatory variables included in the model are:
X_1= Gender (D=1 if female; 0 otherwise)
X_2= Marital status (D=1 if married; 0 otherwise),
X_3= Age of business owner (Years)
X_4= Number of years of formal schooling of business owner
X_5= Number of employees
X_6= Distance of enterprise to nearest transformer (kilometre)
X_7= Electrified enterprises (D=1, if Yes; 0 otherwise),
X_8= Access to alternative source of energy (D=1, if Yes; 0 otherwise),
X_9= Power outage (number of days)
X_{10}=Monthly expenditure on alternative source of power (naira)

Ordinary Least Square (OLS) method was employed to determine the effect of electrification on microenterprise performance. The model is specified below

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots \beta_m X_m + u_i$$

Y= Performance of the firm (measured in terms of sales turnover of the firms)
X_1 = explanatory variables
β_0 = constant
β_1 = regression parameters to be estimated.
u_i = error term

The explanatory variables included in the model are:
X_1= Gender (D=1 if male; 0 otherwise)
X_2= Number of employees
X_3= Age of business owner (Years)
X_4= Number of years in business
X_5= Monthly expenditure on electricity
X_6= Nature of business (D=1 if Individual; 0 otherwise)

X_7= Durations of power supply (Number of hours daily)
X_8= Durations of monthly power outage (numbers)
X_9= Monthly billing method (D=1, if prepaid billing; 0 otherwise)
X_{10}= Access to alternative source of power supply (D=1, if Yes; 0 otherwise),
X_{11}= Monthly expenditure on alternative energy sources

4. RESULTS AND DISCUSSION

Socio-economic and Demographic Characteristics of Rural entrepreneurs

As shown in Table 1, the gender characteristics of the respondents' show that 52.4% were male while 47.6% were female. This reveals that more male than female entrepreneurs responded to the questionnaire. Majority (46.2%) of the rural entrepreneurs were aged between 31 and 40 years. This age range showed that the respondents possessed age advantages which indicate that they are still very active and they can still perform business activities efficiently to increase their level of performance. Majority (43.4%) of the rural entrepreneurs are married. The marital status enhanced economic status and it is sometimes used as an indicator to determine level of commitment and attitude to work. Thus a vast majority have support from home to run their business activities. Also majority (58.7%) had primary education. Education is of great importance in the success of any business venture. It can indirectly determine the level of profitability of business as well as enhance the adoption of new innovation and technologies.

Business ownership structure is a major factor that determines good performance level and market participation. The distribution of respondents by the ownership structure shows that the bulk of the microenterprises (59.4%) were owned by individuals. About 11.2% of the businesses were family business while (21%) were owned through partnership. This result portrays the significance of social recognition and self-esteem among respondents. The implication of this result indicating majority individual business ownership is that decision making process will not be delayed and there will be no barrier to increasing production level. Income from business activity is a major determinant of profitability. Majority of the respondents (30.8%) generate income between ₦20,100- ₦30,000 per month. About 28.7% of the respondents had less than ₦10,000 per month.

Majority (55.6%) of the microenterprise business had been in operation between 1-5 years. The result also indicates a sizeable number of the businesses are older than five years which implies that the survival rate of microenterprise business among rural men and women in the study area is high and improving. The availability of financial fund to microenterprise business is vital to profit to be realized. Among the various financial sources available to the respondents' greater proportions of the rural entrepreneurs (52.4%) funded their business through personal savings. Among other factors, this may be due to low level of education and lack of collateral. This was followed by cooperative society (25.9%) and relatives (9.1%).

Table 1. Socio–Demographic and Economic Characteristics of Respondents

Variables	Frequency	Percentage
Gender		
Male	75	52.4
Female	68	47.6
Age		
≤30	42	29.4
31-40	66	46.2

41-50	24	16.8
>50	11	7.7
Marital status		
Single	55	38.5
Married	62	43.4
Separated	10	7.0
Widowed	12	8.4
Divorced	4	2.8
Educational level		
No formal education	10	7.0
Primary education	84	58.7
Secondary education	35	24.5
Tertiary education	14	9.8
Business ownership structure		
Individual		
Family	85	59.4
Partnership	16	11.2
Company	30	21.0
	13	8.4
Monthly total income		
₦<10,000	41	28.7
₦10,100- ₦20-000	26	18.2
₦20,100-3₦0,000	44	30.8
₦30,100-₦40,000	19	13.3
>₦40000	13	9.1
Years of business operation		
1-5	80	55.6
6-10	34	23.8
11-15	20	14.0
>15	9	7
Source of financial fund		
Personal savings	75	52.4
Relatives	13	9.1
Formal institution	8	5.6
Cooperative	37	25.9
Friends	10	7.0

Source: Field Survey, 2018

Nature and types of microenterprise among rural entrepreneurs

Among the various lines of businesses in Fig. 1, hair dressing and retail shop were the most common form of businesses in the study area. The table further shows that grain milling followed by tailoring, welding, relaxation sports centre and cassava processing constituted a significant part of the type of microenterprise.

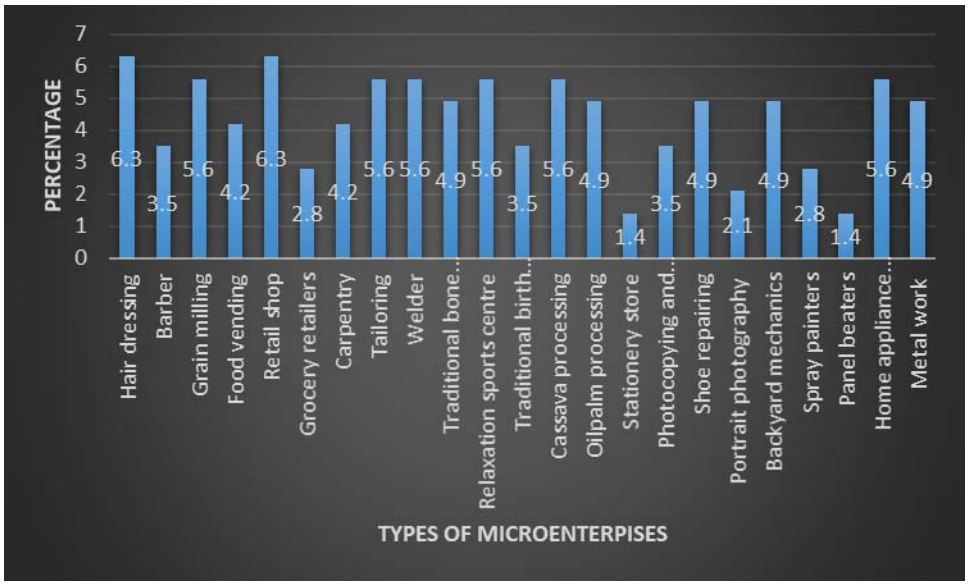

Fig. 1. Nature and type of microenterprise

Factors Determining Grid Connectivity by Rural Entrepreneurs

Table 2 shows the result of the logit analysis for the study area. The result shows that Chi-square is significant. This indicates that the model has a good fit to the data. An additional insight was also provided by analyzing the marginal effects. This indicates how a one-unit change in an explanatory variable affects observation. It was calculated as the partial derivatives of the non-linear probability function, evaluated at each variable sample mean (Greene, 1990). Out of the ten independent variables used in the model, five variables were found to be significant in determining the grid connectivity among rural micro entrepreneurs. The age of the respondents had a positive and significant impact on microenterprise grid connectivity for energy supply. This implies that a unit increase in the age the rural entrepreneur will significantly increase the probability of connection to electricity grid by 3.2%.

Years of schooling was also found to have a significant and positive relationship with connection to electricity grid. This is as expected, since the level of education which is a social capital positively affects decision making process and the level of efficiency in managing enterprises' resources. The implication of the result is that, a unit increase in the number of years of schooling increased the extent of grid connectivity by 4.7% in the study area. The result further reveals that electrified enterprises were important factors in determining grid connectivity among rural entrepreneurs. The result implies that an increase in electrified enterprises will increase the probability of grid connectivity by 0.0548 units.

Additionally, Table 2 reveals a positive relationship between grid connectivity and monthly expenditure on alternative source of power. It implies that an additional increase on monthly expenditure on alternative source of power will increase the rate of grid connectivity by 2%. Furthermore, reliable power supply is necessary for the effective operation of microenterprise. Number of days of power outage shows a negative relationship with grid connectivity by the respondents and it is significant at 5%. An additional increase of power outage will significantly decrease the probability of grid connectivity by 0.0146 units.

Table 2. Logit regression results of factors determining

grid connectivity by rural entrepreneurs.

Variables	Coefficient	Standard Error	/Z/	Marginal Effect
Constant	1.3524	1.7002	0.24	
Gender	0.0965	0.5572	0.06	0.0051
Marital Status	0.0721	0.3205	0.23	0 .0102
Age	0.0982**	0.0269	0.66	0.0327
Years of Schooling	0.0726*	0.2105	1.1	0.0470
No of employee	1.0997	0.1227	0.85	0 .0139
Dist. to transformer	-0.9617	0.0988	-0.38	-0.0057
Electrified business	0.1531***	0.9855	3.81	0 .0548
Access to alternative source of power	1.8341	1.0389	1.07	0.0971
Monthly expenditure on alternative power	0.0162*	0.0439	0.23	0.0246
Power outage	-0.0478**	0.0376	1.89	-0.0146

log likelihood -58.6032 LR chi^2 (9) 34.34 Prob>chi^2 0.000
Pseudo R^2 0.4036
Note: ***, ** and * are significance level at 1%, 5%, and 10% respectively.

Source: Field Survey, 2018

Effect of Electricity Service on Profitability of Microenterprise of Rural Entrepreneurs

The empirical result of the OLS analysis shows the important factors that influence microenterprise profitability of rural entrepreneurs in the study area. Years spent in business operation is a proxy for measuring experience business because over time, enterprises owners would have learnt how to minimize cost and optimize productivity. Number of years spent in business was significant at 5% level with a positive sign. This shows an additional increase in the number of years spent in business will increase microenterprise profitability by 0.68 units.

Also, energy supply serves as an indispensable input in business activities. Effective flow of electricity serves as an input in production processes and enhances consumers' satisfaction. Durations of power supply daily was significant at 5% level with a positive sign. This shows an additional increase in the number of hours of power supply will increase microenterprise profit by 0.023 units. This result is in consonance with Frederick and Josephine (2016) who revealed a significant influence between power supply and SMEs performance, indicating that if there is availability of power for production, firms are likely to have higher chance of being profitable and vice versa.

Poor electricity supply or lack of available power supply to business enterprises is a hindrance to firm's productivities and performance such as causing many inputs to be idle when there is power outage. Durations of power outage was significant at 5% level with a negative sign. This indicate that an hour decrease in the supply of power for business operation will lead to 2.3% decrease in the microenterprise performance. Adding up to this problem is that power outages result in huge business loss and retard microenterprise activities. This result is in line with Cissokho and Seck (2013), who ascertained that scale efficiency of SMEs was negatively affected by the both the frequency and duration of power outages.

Billing method of power supply was also significant at 10% level with a negative sign indicating that an increase in the use of estimated bill will decrease microenterprise performance by 2.6%. This negative relationship was expected as continuation in the usage of estimated billing method leads to increase in cost of operations for the business. Furthermore, expenditure on alternative energy source was significant at 5% level with a positive sign, showing that increase in the use of alternative source of energy is associated with higher level microenterprise performance. This result implies that enterprise owners are aware of the importance of electricity to the profitability of their enterprises and increase the use of alternative source of power for business operations will save time, making the goods and services available to customers when needed. This also helps in building enterprise image.

Table 3. OLS result of the effect of rural electrification on profitability of microenterprise

Variables	Coefficient	Standard Error	t- value
Constant	0.9854	0.2321	0.12
Gender	0.9273	0.1185	0.78
No of employees	0.0267	0.8460	1.28
Age	0.3061	0.0708	0.43
Years in business	0.6897*	0.0924	1.16
Expenditure on electricity	0.2365	0.0947	1.21
Nature of business	0.0346	0.0457	0.76
Duration of power supply	0.0234**	0.1663	-1.41
Duration of power outage	-0.2713*	0.6355	-0.32
Billing Method	-0.0264*	0.0113	0.15

Expenditure on alternative energy source	0.3946**	0.7025	3.41
F(10, 101) 3.44	Prob > F 0.0000		R^2 0.554
Adjusted R^2 0.5102			

Note: ** and * are significance level at 5%, and 10% respectively.

Source: Field Survey, 2018

5. CONCLUSION AND RECOMMENDATIONS

Microenterprises are believed to be the engine room for the development of any economy because they form the bulk of business activities in a growing economy like Nigeria. The expansion of microenterprises in rural areas is linked with the increase in access and use of electricity services, leading to changes livelihood and income. This paper provides empirical evidences on the impact of electricity service on performance of microenterprises of rural entrepreneurs. From the study different types of microenterprises was established like hair dressing, retail shop, grain milling followed by tailoring, welding, relaxation sports centre and cassava processing. In addition, growth of microenterprises in terms of years of business operation was established.

Econometric estimations from this study reveals that there is a positive and significant relationship between monthly expenditure on alternative source of power and the microenterprise owner decisions to connect to grid electricity service. The implication of this is that the high cost of electricity generation from alternative source encouraged the microenterprise owner to adopt national grid connection due to high cost of fuel and maintenance. Also, the paper confirms a negative and significant relationship between duration of power outage and connection to grid electricity service by microenterprise owner. This implies that inadequate and erratic supply from the national grid had a negative influence on the decision of the entrepreneur to adopt grid electricity service. In addition, the result reveals that age, years of schooling, nature of business, supported the microenterprise owner decision to connect grid electricity service. Furthermore, the study confirmed that there is a positive significant relationship between power supply and firm profitability. This indicates that effective flow of electricity in production and service processes, enhances firms' profitability. Also, expenditure on alternative power supply significantly has a positive impact on the profitability of microenterprise.

Based on the findings of this study, it is recommended that to increase gird electricity connection among rural entrepreneurs, Government should intensify action in providing rural communities with reliable and affordable electricity services, which is one of the crucial elements in microenterprises establishment, growth, expansion and performance. In addition, Government is advised to provide cheaper sources of credit to rural entrepreneurs with little or no collateral to encourage their enterprises growth. Also, microenterprise owners should consider alternative sources of power to mitigate power outage to save time, making goods and services available to customers when needed.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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