Eurasian Journal of Agricultural Research 2023; Vol: 7, Issue: 1, pp: 59-72

Technological Assessment of the Effect of Electricity Power Supply on Agriculture: Evidence from Southwestern Nigeria

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Abstract

The study examined the impact of electricity power supply on agriculture in the southwestern Nigeria. Multi-stage sampling technique was used to sample two hundred (200) small-holder farmers in Ondo and Ekiti States, through the use of validated structured questionnaire, out of which 188 copies were properly completed and found analyzable, thus representing 94% return rate. Data obtained were analyzed using simple percentages, mean with standard deviation as well as binary logistic regression model. The results showed that electricity power supply had high impact on preservation of farm produce. Also, unstable power supply was perceived by the farmers to have negatively affected the level of productivity ($\bar{x}$ = 2.61), makes preservation impossible ($\bar{x}$ = 2.88), leads to low level of profitability ($\bar{x}$ = 2.68), brings about low level of innovative farming activities ($\bar{x}$ = 2.74), increased running cost ($\bar{x}$ = 2.69) and high cost of living in rural areas. Furthermore, results of binary logistic regression revealed that power supply in the production of arable crops, shows that only age was identified as a significant factor influencing knowledge of the importance of power supply on agricultural activities,with younger farmers having the likelihood of increasing knowledge by two(2) times, while compared to older farmers. It was concluded that electricity power supply has a great effect on agricultural production and farmers' profitability.

Keywords: Assessment, Technology, Electricity, Effect

Research article
Received Date: 22 November 2022
Accepted Date:18 June 2023

INTRODUCTION

Agriculture is an important driver of any economy and a veritable engine of growth in any developing society as it provides employment, reduces poverty, ensures food security and enhances economic development (Oyakhilome and Zibah, 2014). It is therefore the backbone of the Sub-Saharan economies (Balarane and Oladele, 2012). As such, most Africans depend on agriculture for their livelihoods, and it is estimated that about 86 percent of rural people in the continent rely directly or indirectly on agriculture as source of income and for the provision of jobs for about 1.3 billion people (Tita, 2009). It is estimated that the yearly global quantum of food losses through wastage was averagely put at 40% for fruits and about 50% for vegetables and root crops as at 2011 (FAO, 2012).

Kalamkar, Swain and Bhaiya, (2015) opined that agricultural sector is critical in achieving economic goal of any nation, as it reduces poverty, provides food and nutritional needs of people, supplies raw materials for industries and generates foreign exchange for nations of the world; especially in the Sub-Sahara Africa. Equally, Olayemi, Adegbola, Bamishaiye and Aawagu (2012) stated that as much as 25% and 40% of fruits and vegetables respectively, are lost after harvest and reasoned that farmers could be experiencing serious postharvest losses in Nigeria, particularly, due to poor power supply and poor postharvest strategies in the country.

Chindarkar, Chen, and Sathe (2017) stressed that electricity is a key input necessary for sustainable agricultural growth; especially in terms of irrigation. To this end, electricity power supply has continued to be heavily subsidized in some parts of the world especially in India, (Word Bank, 2013).

Also, Goldemberg, La Rovere and Coelho (2004) have argued that despite the importance of stable power supply to every aspect of human endeavour, especially as it relates health, education and agriculture, its unhindered access has remained elusive in the developing countries of the world. According to the International Energy Agency (2013), the Sub-Saharan Africa countries are noted to have recorded an estimated 68% electricity deficit which has resulted in low level of productivity across various sectors of the economies of African countries. The agency therefore warned that if concerted efforts are no put in place in terms of policies and programmes, it is most likely that as much as 1.2 billion people would be without electricity power supply in this part of the world by the year 2030.

As part of the measures to address the deficiency of power supply in Nigeria, the Electricity Power Sector Reform Act (EPSRA) was passed in 2005 with the objective of transferring the control and operations of the industry from government to the private sector in order to ensure improved efficiency and more investment in the critical infrastructure so as to promote market determined pricing and structure, as well as to bridge the gap between power supply and demand in the country (Onyekwena, Ishaku and Akanonu, 2017).Therefore, there is a clear evidence supporting positive correlation between stable power supply and increased agricultural and other allied activities' productivity in any part of the world (Badiani and Jessoe, 2014; Fan, et al., 2002; Kumar, 2005).

In view of the importance of stable power supply and improved productivity, a number of researches have been undertaken by various scholars. For instance, Onuk, Shehu, and Anzaku (2018) examined factors affecting the marketing of perishable agricultural products in Minna, Niger State, Nigeria and discovered that 58 percent of farm products are lost to spoilage during loading and transportation to the markets; as the products are not in any way preserved before or during transportation from the farms to the points of purchase.

Also, Elusakin, Ajide and Diji (2014) assessed the importance of off-grid electricity generation projects as implemented in the various rural communities in Nigeria and discovered abysmal failure of these projects, essentially due to failure to adhere to the precautionary measures necessary to be undertaken before embarking on such projects. They recommended that proper planning before the implementation of any off-grid power generation project should be undertaken, as this would reduce cost, save time and of course minimize resources utilization on such projects. They equally added that this would ultimately put to an end, erratic power supply to the rural areas of Nigeria and would ultimately enhance productivity.

Equally, Ibeawuchi, *et al.,(*2015) examined the prospect of industrial processing of fruits and vegetables such as onions, tomatoes, okra, pepper, carrot and melon for sustainable agro-industrial growth and development in Nigeria and discovered that inadequate provision of infrastructural facilities such as good irrigation system for improved farming activities, good road network for the transportation of harvested farm produce and steady power electricity for storage facilities as major challenges facing that sub-sector of the Nigerian economy. Therefore, it was recommended that government should improve on the provision of infrastructural facilities such as good irrigations system for agricultural production, good road network for transportation and improved electricity power supply in order to facilitate storage facilities for fruits and vegetables. Also, government and the private sector are encouraged to sponsor research and development for capacity building and manpower development to help sustain the fruit and vegetable crop production efforts.

In the same vein, Akpan, Essien and Isihak (2013) analyzed the impact of epileptic power supply on the profitability of micro-sized enterprises in the rural areas of the Niger Delta region of Nigeria. The study revealed that organizations that generate their power supply through generating sets incurred as much as three times of the expenses they would have spent on the tariff of the nationally generated electricity power supply.

As good as these studies might appear to be, less research attentions are paid on the impact of electricity power supply on agricultural activities in Nigeria. Therefore, this study was set to examine the relationship between unstable power supply and agricultural productivity among small holder farmers. Specifically, the study assessed the perceived effect of power supply on farmers' productivity, examined the impact of power supply on the profitability of farmers and identified constraints farmers faced with respect to electricity power supply, aside from the financial losses they incur in the process of crop harvesting and post-harvest management activities in Nigeria.

The federal government of Nigeria, in an attempt to improve the living conditions of rural dwellers in the country has put in place a number of economic policies measures, aimed at making lives better, especially in the last two decades. According to Elusakin *et al.,* (2014) these policies and programmes are either not implemented at all, or are abandoned as a result of paucity of funds for their implementations. One of the identified factors responsible for the dwindling rural population in Nigeria is non-availability or inadequate provision of social amenities such as electricity power supply and potable water supply. Although, the Nigerian Rural Electrification Agency (NREA) was specifically established to address the electricity needs of the rural areas in Nigeria, the outfit currently lacks electricity spatial planning data that could that be used to provide basis for which mode of power supply in form of grid, mini-grid or off-grid that is most appropriate for different parts of rural areas, in terms of cost effectiveness, spread and efficiency (Ohiare, 2015).

Equally, Gustavsson, Cederberg, Sonesson, van Otterdijk and Meybeck (2011) argue that due to non-availability or unstable nature of electricity power supply, food wastages are normally reported in the Sub-Sahara African countries, and that it is important to curtail or eradicate such ugly incidence in order to ensure food sufficiency. They added that globally, about 40-50% of fruits, vegetables and root crops losses are recorded in various parts of the world.

Olayemi, Adegbola, Bamishaiye and Aawagu (2012) also estimated that as much as 25% and 40% of fruits and vegetables are lost to spoilage during harvest or post-harvest activities respectively, in Nigeria, due to poor post-harvest handling measures and unavailability of appropriate storage facilities that are powered by electricity. Therefore, stable power supply is a necessity and an indispensible facility for the day to day living condition of man in his relationship with industrial activities, agricultural mechanization, health delivery, education and leisure (Asumadu-Sarkodie and Owusu, 2017). Also, Odekanle, Odejobi, Dahunsi, and Akeredolu (2020) have argued that constant power supply is a requirement for industrial, domestic and agricultural purposes, as it has been established to have had a strong positive correlation with any society's infrastructural development. It has equally been established that accessibility to constant energy supply enhances overall well-being and living standard of people and has the capacity to increase a nation's exportation drive capabilities (Poveda and Martínez, 2011).

As a result of this, issues surrounding the epileptic power supply in Nigeria have been discussed variously by experts. For instance, the Nigerian Electricity Regulatory Commission (2018) reported that the country has a total of twenty three (23) on-grid generating plants with a total installed capacity of 10,396 MW, out of which 6,056 MW was available for transmission, on the highest basis. From this analysis, it is obvious that there was a serious imbalance between power generation and transmission in Nigeria. This is because the country has a transmission network capacity of 5,300MW as against 7,500MW on the average basis that was theoretically documented which was obviously 29% lower than installed capacity and about 41% lower than available generation capacity (Odekanle, *et al.,* 2020). In addition to this, about 7.4% of transmitted energy is lost in transmission due to poor transmission infrastructure in Nigeria (Nigerian Electricity Regulatory Commission, 2018). Equally, Technical losses in terms of transmission and distribution have equally been reported in the country's power sector, resulting in disproportional level of efficiency, emanating from huge commercial and tariff collection losses being reported in the industry, with less than 50 % of electricity consumed usually paid for and the balance of 50% usually unpaid (World Bank, 2009).

Essentially, electricity is generally required in farming activities for running electrical motors, for pumping water; especially for irrigation purpose, for preserving dairy products, for cold storage, for farm products processing and for animal feed grinding (Oparaku, 2003). In order to meet the challenges of meeting the power needs of farmers, especially in the rural areas, the federal government, through the then Federal Ministry of Power, Works and Housing (FMPW&H) put in place the Rural Electrification Strategy and Implementation Plan (RESIP) in 2016 which was being implemented by the Rural Electrification Agency (REA) with the objectives of promoting agriculture, industrial, commercial, and other socio-economic activities in rural areas, thereby raising the living standards of rural populations through improved water supply, lighting and security; and to promote the use of domestic electrical appliances to reduce the drudgery of household tasks, typically allocated to women. Other objectives of the plan include; promotion of cheaper, more convenient and more environmentally-friendly alternative sources of energy in place of kerosene, candle, fossil fuel-powered generating sets; protection of the nation's health and environment through reduction of indoor pollution and other energy-related environmental problems as well as ensuring reduction in rural-urban migration. In spite of the bold steps taken by the federal government to improve the level of power supply, especially to the rural communities in Nigeria, through its rural electrification strategy and implementation plan, the rate of power supply has remained abysmally low.

For instance, Olanrele (2020) reported that the power supply in Nigeria has remained highly insufficient, recording as low as 3,500MW despite its generation capacity of about 7,000MW and that the rural communities are even worse of; enjoying less than 34% of aggregate power supply in Nigeria. Naturally, the estimated electricity need for developing countries was put at about 1,000MW per one million people (The World Bank Development Indicator 2018). This implies that Nigeria needs an estimated 200,000 MW electricity power supply in view of it estimated population of 200 million people. Therefore, the current low level of power supply, as currently experienced in the country has serious implications for its rural areas, which constitute up to 50 percent of its population, and by extension its agricultural productivity.

MATERIAL and METHOD

The Study Area Description

Nigeria is broadly divided into two major regions- the North and the South, and each of these two regions is known for its agricultural potentials. Purposive sampling technique was used to select southwestern Nigeria for this study. Equally, Ondo and Ekiti Sates were arbitrarily chosen from this region, based on their impressive records of agricultural activities. For the purpose of selecting respondents for the study, Agricultural Development Programme (ADP) head-office in each of the selected states was contacted to identify Local government areas in which highest volume of farm produce were recorded in the last ten years. Based on the information obtained from Agricultural Development Programme (ADP) in each state, list of registered farmers was obtained from each of the local government areas, for the purpose of sample selection. Thereafter, Krejcie and Morgan (1970) sample size table was used to select the representative samples from the population of farmers at 5% error margin. Simple random sampling technique was used to select a total of 200 smallholder farmers at equal proportion of 100 each from the two states.

A total of two hundred copies of questionnaire were administered. However, one hundred and eighty-eight (188) copies were properly completed and retrieved; representing 94% return-rate for the study as stated in Table 1.

Survey Instrument: A structured questionnaire of four (4) main sections was developed and administered on the selected respondents. Section one: this contains information on the socio-economic characteristics of respondents (age, gender, and average income). The section two contains questions on the perceived importance of electricity power supply on cultivation, irrigation, preservation of seeds and seedlings, harvesting and among other variables. Here, farmers were asked to rate their perception of the importance of electricity power supply on their level of productivity, income and general economic status, using 5-point Likert Scale; that is, 1 for (Strongly Disagree) and 5 for (Strongly Agree) for positive statements and this was reversed for the negative statements, in the last 10 years (2011-2021).

Section three comprises of questions on the relevance of electricity power supply on post-harvest agricultural practices. This involves getting information on the level of farmers' awareness, interest, evaluation, trial and adoption of post-harvest practices having to do with the use of electricity power supply; such as refrigerating, drying, processing, branding and packaging of farm produce.

Section four captures the knowledge base of farmers concerning the use of electricity power supply as an inevitable input for agricultural production. The knowledge base of the farmers was measured on a 'Yes' or 'No' basis with '1' and '0' and the skill level of the farmers was measured in terms of importance and competence, with each variable measured on a 5-point rating scale, based on information concerning their awareness of the importance of electricity power supply on agricultural productivity.

Data collected were analyzed with the use of logistic regression, while simple descriptive statistics such as frequency counts, percentages, and mean scores were used to summarize others. For the logistic regression analysis, knowledge of unstable power supply was used as the dependent variable and it was categorized as low (0) and high (1) for the purpose of logistic regression as modeled thus:

Under the Binary Logistic response model, if there are N categories, the probability that a respondent (a farmer) is in a particular category j

$$Pij = \frac{exp\,(ijXi)}{\Sigma^{3}_{j=1}\,(\exp(ijXi)}$$

Where $j=0$, if the level of knowledge is low, and 1 if the level of knowledge is high, based on the categories derived from the knowledge scores from the use of the mean value approach model.

X_i represents a vector of explanatory variables for a respondent i^{th} with j level of knowledge, and β the coefficient of the parameters.

Where z denotes the linear regression function for the variable of knowledge of unstable power supply on farmers under consideration (i.e. $\beta_0 + \beta_1 X_1 + \beta_2 X_2$ -------+ $\beta_n X_n$)

$$P_i\,(Y = 1/X_i)\ \frac{p_i}{1-p_i} = e^{(\beta 0+\beta 1X1+\beta n\,Xn\,+u)} \quad \text{.....(1)}$$

The explicit function is given as

$$P_i\,(Y = 1/X_i)\ \frac{p_i}{1-p_i} = e^{(\beta_0\,+\,\beta_1 X_1+\beta_2 X_2+\,\beta_3 X_3+u)} \quad \text{.....(2)}$$

Where:

α= Constant/intercept

β= Slope (Regression coefficient)

Y = Dependent variable for the study (level of knowledge categorized into low (0), and high (1); and

X_1= Age (in years)

X_2= Monthly income

X_3= Sex (Male= 1, Otherwise = 0)

RESULTS and DISCUSSION

Description of Demographic Characteristics of Respondents

Table 2 presents the distribution of respondents based on their demographic characteristics. About 26.1% of the farmers were within the age bracket of 41 and 50 years, while 17.0%, 12.8%, 12.8%, 6.4%, 12.0% and 6.3% were in the age groups of 51 and 60 years, 31 and 35 years, 36 and 40 years, 60 years and above, 25 and 30 years and 20 and 24 years respectively.The findings show that majority (93.6%) of the farmers were below or equal to 60 years of age, while only 6.4% of them were above 60 years old.

The implication of this finding is that farmers in the study area were still in their productive age, just as it is always the case in the developing countries, especially in the Sub-Sahara Africa, where enormous energy is required for farming activities, in the absence of mechanized farming system, unlike what obtains in the developed part of the world.

The economically active age of 60 years and below has been documented in many scholarly articles across several academic disciplines. For example, the study of Adeyemo and Olatunji (2004) observes that at the age of 60 years and above, the strength to engage in productive ventures may have been drastically reduced and entrepreneurial spirit may not be strong enough to carry out strenuous activities that are associated with non-mechanical efforts in most African countries. Equally, Oluwale, Ilori and Oyebisi (2013) found that no cluster mechanic was above 60 years of age in their study conducted in the Southwestern Nigeria corroborates this finding. The finding was also consistent with the result of Olanrele (2020) who reported that 73% of the respondents who participated in the study that examined the effects of rural electrification on households' welfare were below 60 years old. The fact that peasant farming activities could be strenuous explains its relationship with age.

In terms of gender distribution, the study reveals that a little more than half (55.9%) of the respondents that participated in the study were males, while 44.1% of them were females. The implication of this minor gap difference between men and women participation in the survey may not be unconnected with the fact that there is a serious gender issue in terms of land ownership and land accessibility across African countries.In most cases, women are usually content with land inheritance issues from their husbands' genealogy as they are usually stripe off land entitlement from their original family background. This is because in many cultures in Nigeria, women are disadvantaged in land ownership. This is apart from the fact that many women usually do not have the financial capacity to purchase land or afford to pay for rented land for agricultural purposes. This study therefore confirms the earlier findings of Ajala (2017) who noted that Nigerian women are always denied of equal economic and political empowerment when compared to men, and as such, these discriminating practices are manifested in land ownership across all geographical parts of the country.

On estimated monthly income level in naira, about one-third of the respondents (32.5%) indicated that they were earning between ₦50,001 and ₦70,000 income, on monthly basis, while 20.7%, 18.1%, 15.4% and 13.3% earned between ₦70,001 and ₦90,000, above ₦90,000, less than ₦30,000 and between ₦30,001and₦50,000 respectively. This implies that on the average, most small-holder farmers, despite the numerous challenges facing farming activities in Nigeria, still earn over and above the new nationally approved minimum wage of ₦30,000.00 on monthly basis for civil servants.

Perceived Effects of Power Supply

Results in Table 3 as displayed below, show that, out of the total farmers sampled, about 54.3% indicated that unstable power supply had negative effects on the production of arable crops, through irrigation all year round and further analysis to determine these effects, using grand mean indicated that the effect of unstable power supply on the production of arable crops through the year was perceived to be low with the grand mean of 2.27 out of a total mean of 4.0 with a beach-mark of 2.5.

Also, farmers recorded perceived low effects in the use of power supply to preserve seeds with the mean of 2.43 at 58.5%. This means that arable crop farmers in the study area may be unaware of the use of power supply for irrigation purpose; as such, technologies are not commonly used in most developing countries, especially in Sub-Sahara Africa, because farming is still predominantly done in the traditional methods of using cutlass and hoes to till the ground. Similarly, stable power supply is useful for seeds preservation in countries where agriculture is driven by technologies. However, in the study area, it was observed that arable crop farmers could not establish a serious link between stable power supply and seed preservation, which is an indispensable input for seeds and seedlings preservation.

On the contrary, it was observed that preservation of perishable produce ($\bar{x}$ = 3.62) and powering of machines ($\bar{x}$ = 2.57) among others, recorded to have been influenced by the unstable power supply. This implies that unstable power supply was said to have had negative effects on these identified critical aspects of arable crop farming activities, such as packaging, the use of motorized spraying machines for herbicides and insecticides, extension agents' work of training, entertainment and recreation, as well as preservation of vaccines and chemicals. The farmers interviewed seemed to be familiar with the usefulness of electricity in the above listed activities and their responses seem to be consistent with the findings of Odekanle *et al.,* (2020) who observed that constant electricity supply was very important to agricultural development in terms of food price stability. Therefore, unstable electricity power supply has been argued to have hampered agricultural production in Sub-Saharan Africa as Gustavsson *et al.,*(2011) posited that non-availability of electricity supply has led to food wastages and poor level of profitability among farmers in the continent.

Impact of Unstable Electricity Power Supply

Data in Table 4 show the perceived impacts of unstable electricity power supply on the production of arable crops in the study area. It was shown from the analysis that low yields ($\bar{x}$ = 2.61), impossible preservation ($\bar{x}$ = 2.88), low profitability ($\bar{x}$ = 2.68), low level of innovative farming practices ($\bar{x}$ = 2.74), increased running cost ($\bar{x}$ = 2.69) and high cost of living in rural areas due to unavailability of electricity power supply ($\bar{x}$ = 2.28) had grand mean values of 2.0 and above, from a total mean of 3.0 and this implies that unstable power supply was said to have impacts on arable crops production among farmers in the study area. However, it was observed that unstable power supply was recorded not to have had high impacts on the mortality rate of animal among farmers as well as on supply of portable water. This may fall within the priori expectation, as farmers sampled for this study were predominantly inolved in the cultivation of arable crops, therefore, they may not be involved in livestock production, hence, unable to assess the impact of unstable electricity power supply on livestock production.

The above findings could be used to corroborate the findings of Ohiare (2015), who submitted that lack of electricity power has increased the cost of living in rural areas of Nigeria as food wastage was documented to be higher in rural environment when compared to what was obtainable in cities. Also, the findings of Olayemi *et al.,* (2012) also support the outcome of this research, in that; it estimated that between 25%-40% of arable crops, particularly fruits and vegetables are usually lost in postharvest activities in Nigeria.

Knowledge of the Benefits of Stable Power Supply

Data in Table 5 show that arable crop farmers had high knowledge of the benefits of stable power supply in refrigerators and freezers for the preservation of fresh vegetables and other perishable farm produce ($\bar{x}$= 3.71) and instant dissemination of innovative farming technologies, while they recorded low level of knowledge in the use of powered spraying pumps in the production of vegetables through irrigation practices and in the use of silos for grain preservation. This shows that arable crop farmers lack basic knowledge of stable electricity power supply in farming. This may be due to the fact that lack of electricity power supply to many rural communities must have made some of these farmers to develop alternative traditional methods of preserving their crops and some must have reduced their production capacity in order to reduce wastage. It is a known fact that Nigeria as a developing country with over 200 million people and has electricity transmission network capacity of only 5300MW as against 7500MW that was theoretically documented to have been produced in 2018 and this was obviously 29% lower than the installed capacity and about 41% lower than available generation capacity. In addition to this, about 7.4% of transmitted energy is lost in transmission due to poor transmission infrastructure (Nigerian Electricity Regulatory Commission, 2018).

Determinants of Farmers' Knowledge of Unstable Electricity Power Supply in Crop Production

Table 6 shows that results of binary logistic regression showing the determinants of farmers' knowledge of unstable power supply in arable crop production with only age indicated that older farmers had poor knowledge, while the younger ones had high knowledge. The odd ratio of 2.040 among farmers show that the likelihood of age influencing farmers' knowledge of the effects of electricity power supply is approximately 2 times higher among the younger ones when compared to the older respondents. Unfortunately, farmers' income derived from arable crop production did not in any way influence their knowledge of the importance of electricity power supply in the study area.

The availability and stability of electricity power supply may serve as a factor that promotes an increased level of knowledge. The fact that Nigeria as a developing country that produces electricity power that is far less than its population requirements, and that the country is still unable to utilize the available quantity of power generated means that its citizens, including farmers may not have had regular access to power supply. To worsen this situation, farming is predominantly done in rural areas and electricity power supply has been very unreliable to this areas, based on the findings of Ohiare (2015), that affirmed this through research. The implications of not having adequate power supply in rural areas may have negative impact on knowledge acqusition in these areas. This has therefore made the cost of living to be very high in rural areas and by extension, makes such locations unattractive to an average Nigerian to live.

Table 1. Questionnaire Response Rate Analysis

State	Number of questionnaires administered	Number of questionnaires retrieved	Percentage response (%)
Ondo	100	96	96
Ekiti	100	92	92
Total	**200**	**188**	**94**

Table 2. Distribution of Respondents Based on the Demographic Characteristics

Variable	Frequency	Percentage (%)
Age (year)		
20-24	12	6.3
25-30	22	12.0
31-35	35	18.9
36-40	24	12.8
41-50	49	26.1
51-60	32	17.0
Above 60	12	6.4
Gender		
Male	105	55.9
Female	83	44.1
Estimated monthly income (₦)		
Less than 30,000	29	15.4
30,001-50,000	25	13.3
50,001-70,000	61	32.5
70,001-90,000	39	20.7
Above 90,000	34	18.1

Source: Field Survey, 2022.

Table 3. Effects of power supply

Variables	Freq	%	Mean	Std. Dev
All year-round arable farming through irrigation	51	54.3	2.27*	0.13
Preservation of perishable farm products in terms of refrigeration and smoking	82	87.2	3.62**	0.27
An indispensable input resource for the preservation ofseeds and seedlings	55	58.5	2.43*	0.16
For powering agricultural tools and machines	67	71.3	2.57**	0.36
For the packaging of semi-processed agricultural products	72	76.6	2.55**	0.51
For spraying chemicals and pesticides	59	62.8	2.51**	0.29
For powering machines and equipment for gathering information on emerging developments, especially on farming techniques	87	92.6	3.74**	0.16
It is used by extension workers to train farmers	77	81.9	2.78**	0.18
For entertainment and recreation	69	73.4	2.58**	0.21
For preservation of fish, meat and other dairy products	91	96.8	3.83**	0.38
For preservation of vaccines	85	90.4	3.71**	0.09

*Source: Field Survey, 2022, **Mean > 2.5 = High effects and *Mean < = 2.5 Low effects*

Table 4. Impact of unstable electricity power supply on farming of arable crops

Variable	**Mean**	**Std. Dev**
Low level yield per hectare	2.61**	0.25
Impossible preservation of farm produce	2.88**	0.09
Low level of profitability	2.68**	0.15
Low level of innovative farming practices	2.74**	0.42
High level of mortality rate of farm animals	1.55*	0.51
Increased running cost of farming activities	2.69**	0.64
High cost of living in rural areas due to unavailability of power supply	2.28**	0.72
Poor supply of portable water	1.56*	0.19

*Source: Field Survey, 2022, **Mean > 2.0 = High impact and *Mean < 2.0 = Low impact*

Table 5. Knowledge of Electricity in farming

Knowledge of electricity in farming	**Mean**	**Std. Dev**
Electrical-powered spraying pumps are capable of ensuring production of vegetables even during the dry season of the year	2.11*	0.12
Refrigerators and freezers for the preservation of fresh vegetables and other perishable farm produce are indispensable for every farmer	3.71**	0.41
A mini-silo that is provided by government agencies would ensure availability of grains for consumption and for planting at any time of the year.	2.26*	0.13
The use of silo for the preservation of grains is a sure way of making them available at any point in time for consumption and for industrial purpose	2.16*	0.17
Instant dissemination of innovative farming technologies can only be made possible when constant power supply is guaranteed in the farming communities	3.59**	0.32
Provision of portable water for domestic use and for farming activities would generally improve the wellbeing of farmers in Nigeria	2.18*	0.13

Source: Field Survey, 2022.
****Mean > 3.0 = High knowledge and *Mean < 3.0 = Low knowledge**

Table 6. Determinants of Effects

Determinant	**B**	**Odd Ratio**	**Decision**
Age	-0.713	2.040	S
Income (Naira)	0.092	1.096	NS
Sex	0.192	1.212	NS

Source: Field Survey, 2022, -2log-likehood ratio = 119.3610, S = Significance, NS = Non-Significance

CONCLUSION and RECOMMENDATIONS

The importance of electricity power supply to agriculture cannot be overemphasized, especially in countries that have technological prerequisite for economic advancement. One of the problems of agriculture in developing countries has been unstable electricity power supply and this has been attributed to the huge post-harvest losses of perishable crops in Nigeria. Therefore, the study assessed the effects of unstable electricity power supply on agricultural sector using statistically selected arable crop farmers in Ondo and Ekiti States, Nigeria, with a view to examining the impacts of power supply on crop production. Purposive and simple random sampling procedure was used to select 188 arable crop farmers across the two states with the use of Krejcie and Morgan (1970) sample size table at a response rate of 94%. Data were collected with the use of structured questionnaire and analyzed with logistic regression while frequency, percentages and mean were used to describe the data.

Some of the findings revealed that about 87.3% of the sampled farmers were between the productive ages of 30 and 60 years and slightly above average (55.9%) were males, although women's population in arable crop production was equally high. Meanwhile, 84.6% of the farmers earned ₦30,000.00 and above as their monthly income. The respondents indicated that unstable power supply had low effects on some important aspects of farming in Nigeria, such as irrigation, seeds and seedlings preservation.They equally indicated that electricity power supply had high impact on preservation of farm produce, since many of their produce are highly perishable. Furthermore, unstable power supply was perceived to have had high impact on farmers' yields (Mean = 2.61), makes preservation impossible (Mean = 2.88), lead to low profitability (Mean = 2.68), low level of innovative farming practices (Mean = 2.74), increased running cost (Mean = 2.69) and high cost of living in rural areas, due to unavailability of power supply (Mean = 2.28).

Furthermore, the study revealed that farmers had high level of knowledge of the benefits of stable power supply in refrigerators and freezers for the preservation of fresh vegetables and other perishable farm produce (Mean= 3.71) and instant dissemination of innovative farming techniques. Results of binary logistic regression to identify the determinants of farmers' knowledge of unstable power supply in the production of arable crops show that only age was identified as a significant determinant, with younger farmers having the likelihood of increasing their knowledge by two(2) times. The findings concludes that arable crop farmers do not perceive the impact of unstable power supply high on the production of arable crops and this may be attributed to the low production status of most farmers in Nigeria, as traditional methods of production dominate the arable crop production activities in Nigeria.

The findings thus recommend that arable crop farmers in the study area should be sensitized on the importance of powered motorized farming system, particularly irrigation farming techniques as this will promote off season farming, which has been documented to be more profitable by many researchers. Also, government should ensure that regular power supply is guaranteed in rural areas, through the implementation of more electricity projects in rural areas of Nigeria, knowing well the significance of rural areas in food production the country.

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