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THE RURAL ELECTRIFICATION AGENCY OF NIGERIA AND POWER SUPPLY IN KOGI STATE, NIGERIA: AN EMPIRICAL ANALYSIS

Precious EleOjo Onoja, Hassan Achimugu
University Anyigba, Nigeria
Email: onojaprecious542@gmail.com

* Correspondence: Precious EleOjo Onoja

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ABSTRACT

Nigeria faces a significant energy access deficit, with rural communities disproportionately affected by unreliable or non-existent electricity supply. In response, the Rural Electrification Agency (REA) was established to bridge the power access gap through initiatives such as solar Mini-Grids and standalone home systems. This study investigates the impact of REA's interventions in four rural communities in Kogi East; Ikem Ogugu, Ugbedomagwu, Ejule, Ala, and Agojeju-Odo; between 2015 and 2025. The research evaluates the extent to which these interventions have improved electricity access, reliability, and quality, while also examining the challenges hindering project effectiveness. Employing both quantitative and qualitative methods, the findings reveal a moderate but uneven improvement in electricity delivery and socio-economic conditions across the communities. Specifically, the study provided recommendations such as strengthen community involvement in implementation and maintenance, expand beyond residential connections to productive uses, improve energy reliability through hybrid systems and maintenance support, enhance security infrastructure alongside electrification projects, institute performance monitoring systems for rural electrification projects, prioritize policy alignment and decentralized planning.

Introduction

The Nigerian power sector continues to grapple with challenges in delivering reliable electricity, particularly in rural and underserved regions (Fasina et al., 2021; Ismaila et al., 2022; Jimoh & Raji, 2023; Tella, 2023). As of 2023, Nigeria had the world's largest energy access deficit, with approximately 88.5 million people—equating to a 59.5% electrification rate—lacking access to grid electricity. Rural communities remain the most affected, relying heavily on costly and inefficient alternatives such as diesel generators, which collectively provide an estimated 42GW of backup power—nearly eight times the installed peak generating capacity of the national grid (EU Global Technical Assistance Facility, 2024). To address this disparity, the Nigerian government established the Rural Electrification Agency (REA) in 2006 as part of broader power sector reforms (Rural

Electrification Agency, 2022). The REA is mandated to expand electricity access in rural and semi-urban areas through off-grid and grid extension solutions, including the implementation of the Rural Electrification Strategy and Implementation Plan (RESIP), which targets 75% rural electrification by 2025 (Federal Ministry of Power, 2016).

Kogi State, situated in Nigeria's North Central region, exemplifies both the challenges and opportunities of rural electrification. Despite efforts, only 62.5% of households in the state had access to electricity as of 2018, below the national average of 71.8% (National Bureau of Statistics, 2019). The state's rural topography and community dispersion pose specific hurdles for electricity infrastructure rollout. Within Kogi State, the REA has initiated several projects, including mini-grid installations and standalone solar home systems.

Communities such as Ikem Ogugu (Olamaboro LGA), Ugbedomagwu (Igalamela LGA), Ejule, Ala (Ofu LGA), and Agojeju, Odo (Omala LGA) have been direct beneficiaries of these interventions. These projects, ranging from solar mini-grids to solar home systems, seek to enhance energy access in areas historically underserved by the national grid. However, a comprehensive assessment of their impact on local electricity access and socio-economic outcomes has yet to be conducted. Evaluating REA's contributions to power supply in these specific communities is essential .(Babalola et al., 2022; Koepke et al., 2023; Osunmuyiwa & Ahlborg, 2022)

It provides critical insight into the effectiveness of Nigeria's rural electrification strategy at the grassroots level and highlights lessons that can inform future interventions. Moreover, this assessment will support evidence-based policymaking for sustainable rural energy development in Kogi East and beyond. Previous studies have explored national trends in rural electrification, but there remains a gap in research focusing specifically on community-level outcomes in Kogi East. This study addresses that gap by focusing on the impact of REA's projects in four key communities and assessing their role in improving electricity access and local development.

Previous research on rural electrification in Nigeria has largely focused on national-level trends and macroeconomic evaluations. For instance, Oji et al. (2012) examined the potential of renewable energy sources in Nigeria, emphasizing policy gaps but not assessing the localized impact of rural electrification interventions. Similarly, Abam et al. (2018) assessed electricity generation and distribution issues across Nigeria but did not disaggregate data to reflect the socio-economic effects of electrification efforts at the community level. While these studies offer valuable insights into systemic challenges and national energy profiles, they fail to evaluate the micro-level effectiveness of specific agencies like the Rural Electrification Agency (REA) in targeted regions such as Kogi East (Hazell et al., 2022; Ingleby et al., 2022; Kusumaningrum & Ricardo, 2022; Subalusky et al., 2021; Xue et al., 2021). This study addresses that critical gap by assessing the tangible outcomes of REA interventions in four rural communities in Kogi State—Ikem Ogugu, Ugbedomagwu, Ejule, and Agojeju-Odo. By focusing on electricity access, power quality, and socio-economic development from 2015 to 2024, this research contributes empirical evidence essential for localized policy refinement.

The objectives of this study are designed to establish clear and measurable goals that will guide the research methodology and analysis. Specifically, the study aims to quantify electricity access rates in rural areas of Kogi State that are attributable to the interventions made by the Rural Electrification Agency (REA) between 2015 and 2024. Additionally, the research seeks to evaluate the quality of power supply delivered to these rural communities benefiting from REA's projects, thereby providing a comprehensive assessment of both access and service quality in the region. The study's benefits lie in its potential to inform evidence-based policy at both state and national levels, guide more targeted investments in rural electrification, and ensure that development outcomes align with Nigeria's broader energy access goals.

Research methods

This study employs a mixed-method research design that integrates both quantitative and qualitative approaches to provide a comprehensive assessment of the contributions of the Rural Electrification Agency (REA) to electricity supply in Kogi East, Nigeria. The quantitative component involves administering structured questionnaires to residents in five purposively selected communities—Ikem Ogugu, Ugbedomagwu, Ejule, Ala, and Agojeju, Odo—while the qualitative aspect complements these findings through key informant interviews with REA field officers, local leaders, and selected residents. The study area is situated within the predominantly rural Kogi East Senatorial District of Kogi State, characterized by low electricity penetration, dispersed settlements, and infrastructural challenges. Four Local Government Areas (LGAs) within this district were selected based on documented REA interventions. These communities represent various types of electrification projects, including solar mini-grids and solar home systems, with an estimated total household population of 3,110, which forms the sampling frame for the quantitative study. To determine the minimum sample size, Taro Yamane's formula (1967) was applied, yielding a sample size of 354 respondents. A probability-based stratified random sampling technique was adopted to ensure fair and proportional representation of each community, treating each as a stratum, with respondents randomly selected based on the community's proportion of the total population.

Results and Discussion

Analysis of Electricity Access Data

This section presents the analysis of data relating to the first research objective, which seeks to assess the extent to which the REA's interventions have increased electricity access in rural areas of Kogi East.

Table 1. Respondents' Opinions on Electricity Access (N = 354)

Statement	Response	Frequency	Percentage (%)
B1: I currently have access to electricity in my household.	Strongly Disagree	21	5.93%
	Disagree	45	12.71%
	Undecided	55	15.54%

	Agree	112	31.64%
	Strongly Agree	121	34.18%

Source: Field Survey, 2025

The analysis reveals a positive trend in electricity access among the respondents. A combined 65.82% (Agree + Strongly Agree) reported they currently have access to electricity in their households.

Table 2. Respondents' Opinions on Electricity Access (N = 354)

Statement	Response	Frequency	Percentage (%)
B2: The REA project has provided my household with electricity access.	Strongly Disagree	20	5.65%
	Disagree	35	9.89%
	Undecided	57	16.10%
	Agree	125	35.31%
	Strongly Agree	117	33.05%

Source: Field Survey, 2025

68.36% acknowledged the role of REA in facilitating this access.

Table 3. Respondents' Opinions on Electricity Access (N = 354)

Statement	Response	Frequency	Percentage (%)
B3: Before the REA intervention, my community had very limited access to electricity.	Strongly Disagree	17	4.80%
	Disagree	48	13.56%
	Undecided	53	14.97%
	Agree	124	35.03%
	Strongly Agree	112	31.64%

Source: *Field Survey, 2025*

Before the REA intervention, 66.67% of respondents indicated that electricity access in their communities was very limited, which validates the need for the projects.

Table 4. Respondents' Opinions on Electricity Access (N = 354)

Statement	Response	Frequency	Percentage (%)
B4: The electricity provided by the REA has reached most households in my community.	Strongly Disagree	18	5.08%
	Disagree	41	11.58%
	Undecided	52	14.69%
	Agree	125	35.31%
	Strongly Agree	118	33.33%

Source: *Field Survey, 2025*

Additionally, 68.64% believe that the REA, provided electricity has successfully reached most households.

Table 5. Respondents' Opinions on Electricity Access (N = 354)

Statement	Response	Frequency	Percentage (%)
B5: The process of getting connected to REA electricity was straightforward and accessible.	Strongly Disagree	12	3.39%
	Disagree	30	8.47%
	Undecided	60	16.95%
	Agree	128	36.16%
	Strongly Agree	124	35.03%

Source: *Field Survey, 2025*

Data from survey reveals that 71.19% found the connection process straightforward and accessible.

Table 6. Respondents' Opinions on Electricity Access (N = 354)

Statement	Response	Frequency	Percentage (%)
B6: My household benefited directly from the REA Mini-Grid or solar project.	Strongly Disagree	17	4.80%
	Disagree	29	8.19%
	Undecided	61	17.23%
	Agree	118	33.33%
	Strongly Agree	129	36.44%

Source: *Field Survey, 2025*

69.77% reported benefiting directly from the REA Mini-Grid or solar systems.

Table 7. Respondents' Opinions on Electricity Access (N = 354)

Statement	Response	Frequency	Percentage (%)
B7: Since the REA intervention, there has been a notable improvement in household energy access.	Strongly Disagree	13	3.67%
	Disagree	30	8.47%
	Undecided	49	13.84%
	Agree	143	40.40%
	Strongly Agree	119	33.62%

Source: *Field Survey, 2025*

A significant 74.02% observed notable improvements in household energy access after the interventions.

Table 8. Respondents' Opinions on Electricity Access (N = 354)

Statement	Response	Frequency	Percentage (%)

B8: Access to electricity has reduced our reliance on traditional energy sources (e.g., kerosene lamps, firewood).	Strongly Disagree	11	3.11%
	Disagree	33	9.32%
	Undecided	61	17.23%
	Agree	137	38.70%
	Strongly Agree	**112**	**31.64%**

Source: Field Survey, 2025

A considerable proportion (70.34%) also affirmed that access to REA, provided electricity has reduced their reliance on traditional energy sources, demonstrating the shift toward modern energy usage.

Analysis of Electricity Supply quality

This section analyzes responses related to the third research objective, which evaluates the quality of electricity supply resulting from REA interventions in Kogi East.

Table 9. Respondents' Opinions on Electricity Supply quality (N = 354)

Statement	Response	Frequency	Percentage (%)
D1: The electricity supply to my household is generally stable.	Strongly Disagree	23	6.50%
	Disagree	31	8.76%
	Undecided	54	15.25%
	Agree	130	36.72%
	Strongly Agree	116	32.77%

Source: Field Survey, 2025

The findings reveal a largely positive perception of electricity supply stability and quality in the REA, intervened communities. For overall household supply stability, 69.49% of respondents agreed or strongly agreed that supply is generally stable.

Table 10. Respondents' Opinions on Electricity Supply quality (N = 354)

Statement	Response	Frequency	Percentage (%)
D2: Electricity is available for a predictable number of hours daily.	Strongly Disagree	21	5.93%
	Disagree	26	7.34%
	Undecided	47	13.28%
	Agree	119	33.62%
	Strongly Agree	141	39.83%

Source: Field Survey, 2025

73.45% of respondents for this study confirmed that electricity is available for a predictable number of hours each day.

Table 11. Respondents' Opinions on Electricity Supply quality (N = 354)

Statement	Response	Frequency	Percentage (%)
D3: The voltage of the electricity supply is stable and suitable for household appliances.	Strongly Disagree	19	5.37%
	Disagree	32	9.04%
	Undecided	69	19.49%
	Agree	118	33.33%
	Strongly Agree	116	32.77%

Source: *Field Survey, 2025*

Voltage stability, crucial for appliance safety, was affirmed by 66.10% of respondents.

Table 12. Respondents' Opinions on Electricity Supply quality (N = 354)

Statement	Response	Frequency	Percentage (%)
D4: Instances of complete blackouts have decreased significantly since REA intervention.	Strongly Disagree	17	4.80%
	Disagree	33	9.32%
	Undecided	51	14.41%
	Agree	112	31.64%
	Strongly Agree	141	39.83%

Source: *Field Survey, 2025*

The table above show a combination of 71.47% indicating that complete blackouts have significantly reduced since REA's intervention.

Table 13. Respondents' Opinions on Electricity Supply quality (N = 354)

Statement	Response	Frequency	Percentage (%)
D5: My household experiences fewer surges, low voltage, or electricity spikes.	Strongly Disagree	13	3.67%
	Disagree	25	7.06%
	Undecided	51	14.41%

	Agree	118	33.33%
	Strongly Agree	147	41.53%

Source: Field Survey, 2025

Surge and voltage fluctuations appear less frequent, with 74.86% agreeing or strongly agreeing that such issues have diminished.

Table 14. Respondents' Opinions on Electricity Supply quality (N = 354)

Statement	Response	Frequency	Percentage (%)
D6: The electricity infrastructure (wires, poles, meters) installed is of good quality.	Strongly Disagree	11	3.11%
	Disagree	37	10.45%
	Undecided	49	13.84%
	Agree	115	32.49%
	Strongly Agree	142	40.11%

Source: Field Survey, 2025

The quality of electricity infrastructure was positively rated by 72.60% of respondents, showing trust in the technical quality of installations.

Table 15. Respondents' Opinions on Electricity Supply quality (N = 354)

Statement	Response	Frequency	Percentage (%)
D7: The REA, installed power systems meet the electricity needs of my household.	Strongly Disagree	13	3.67%
	Disagree	25	7.06%
	Undecided	53	14.97%
	Agree	138	38.98%
	Strongly Agree	125	35.31%

Source: Field Survey, 2025

Data reveals that 74.29% of respondents agreed that REA systems meet their household energy needs

Table 16. Respondents' Opinions on Electricity Supply quality (N = 354)

Statement	Response	Frequency	Percentage (%)
D8: Overall, the electricity system is reliable enough for productive activities (e.g., business operations).	Strongly Disagree	17	4.80%
	Disagree	34	9.60%
	Undecided	65	18.36%
	Agree	133	37.57%
	Strongly Agree	105	29.66%

Source: *Field Survey, 2025*

While 67.23% considered the electricity supply reliable enough for running small businesses and productive activities.

The findings of this study affirm the significant role of the Rural Electrification Agency (REA) in extending electricity access to underserved communities in Kogi State, particularly in Ikem Ogugu, Ugbedomagwu, EjuleAla, and Agojeju-Odo. Across all communities, the results revealed a generally positive perception of the REA's interventions, especially concerning household-level access to electricity. The improvement in accessibility aligns with the modernization theory, which underscores that infrastructure development is foundational for socio-economic progress (Rostow, 1960). Respondents in the current study widely acknowledged that the intervention led to more stable power supply, a finding corroborated by testimonies such as, "my home now has steady light for the first time ever," which illustrates the real-world impact of infrastructure on daily living.

The second objective of this study was to examine the quality of power supply following REA's interventions. Respondents reported significantly fewer blackouts and more consistent availability of electricity. This supports findings from the International Energy Agency (2019), which notes that decentralized solar mini-grids, such as those implemented in Kogi, are instrumental in overcoming challenges associated with unreliable national grids. Furthermore, this reflects the principles embedded in the Multi-Tier Framework by the World Bank, which emphasizes not just access but quality and stability across dimensions such as duration and safety. Participant statements reinforce this observation, with one resident noting, "The power only goes off during heavy rains now," indicating a shift toward more resilient infrastructure.

Conclusion

This study concludes that the Rural Electrification Agency (REA)'s interventions in rural Kogi State have successfully expanded electricity access, contributing to meaningful socio-economic transformations within the communities studied. While improvements in energy access and reliability have supported safer environments, extended productive hours, and improved quality of life, challenges related to energy intermittency and infrastructure maintenance remain. These findings reinforce the importance of viewing electrification not only as a technical solution but as a catalyst for holistic rural development. For future research, it is recommended to employ longitudinal mixed-method approaches that examine long-term social and economic impacts of electrification projects, including metrics like affordability, user satisfaction, gendered outcomes, and resilience to climate shocks. Additionally, future studies should compare the effectiveness of different off-grid technologies and business models to inform more tailored and sustainable energy solutions in rural Nigeria and other developing contexts.

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