

## Extended Abstract

<b>Paper/Poster Title</b>	<b>Rurality Forcing the Lights on: Is this worth it?</b>
---------------------------	--

**Abstract prepared for presentation at the 97<sup>th</sup> Annual Conference of the Agricultural Economics Society, The University of Warwick, United Kingdom**

**27<sup>th</sup> – 29<sup>th</sup> March 2023**

<b>Abstract</b>	<b>200 words max</b>
<p>Energy shortage is a major concern in Nigeria, crippling the economy. Albeit its abundance, use of fossil fuel is not a viable solution considering air pollution. Renewable energy technology like solar-powered hub for homes is gaining prominence. The technology is positioned to address energy deficit especially in rural households but first, household decision makers' question of whether such investment is worth its cost demands answers. We assessed impact of the technology adoption on wellbeing of rural farming households in Nigeria and explored drivers of its diffusion. Designing a Quasi-experiment, we randomly selected 73 subscribers into the treatment group and 219 non-electrified households into the control group. Data were analysed using descriptive statistics, t-test, propensity score matching, and probit regression. We found its adoption increased the wellbeing of adopter households over non-adopters(<math>p &lt; 0.05</math>), confirming our hypothesis that access to stand-alone solar-powered energy by off-grid rural households increased their personal wellbeing. The probit regression result revealed that household income, remittance income, school-aged children in household, flexibility in payment, subsidy scheme, peer effect and pursuit of life's ease increased the probability of its adoption whereas increase in age, proximity to town and access to fossil fuels decreased the probability of adoption(<math>p &lt; 0.05</math>). We recommended government subsidy on the technology. Diffusion may be aided by peer effect hence the recommendation to influence key individuals to adopt.</p>	
<b>Keywords</b>	Adoption, Electricity, Nigeria, Probit regression, Solar energy, Personal Wellbeing
<b>JEL Code</b>	I310, O13, Q2
<b>Introduction</b>	<b>100 – 250 words</b>
<p>Infrastructural decadence resulting from poor governance has thrown a considerable part of Nigeria into darkness. To offset the stymieing effect of power outage, many households have resorted to finding affordable and suitable small-scale decentralized power generation units for own consumption. Many households who have resorted to petroleum-fuelled power generating machines are gradually becoming aware of the attendant environmental sustainability issues. With increasing awareness of better alternatives in renewable energy, the use of solar powered energy sources is gradually being popularized in Nigeria, evident in the rising number of manufacturers and suppliers of solar powered energy hubs for individual homes. This is a more viable option for electrification given its relative affordability, ease of installation, and long-span usability however the question of whether its cost is commensurate to its benefits remains open especially for poor rural households with more competing basic needs.</p>	



We conjecture that adoption of this technology should impact on the wellbeing of the subscribing rural households. However, there is limited evidence to substantiate this position. In this study, we ask two questions. Firstly, how has adopting solar-powered energy hubs for homes impacted on the wellbeing of rural farming households in North Central Nigeria? Secondly, what are the drivers of solar-powered energy hub for homes' adoption in the study area? To the best of our knowledge, such research has not been carried out in Nigeria as majority of the research on renewable energy were attuned to potentials in renewable energy for power generation mostly in engineering fields.

**Methodology**

**100 – 250 words**

This study is Quasi-experimental research designed to gain insight into the impact of adoption of Solar powered energy hub for homes on the wellbeing of rural farming households in Kwara State. We conducted the study in Baruten, Kwara State Nigeria, purposively selected because majority of the rural areas in the Local Government are off-grid while some are on-grid but not had access to electricity in years. The sampling frame from which the treatment group was selected is the household listing of subscribers who had adopted the solar powered energy hub for homes between January and March 2017, numbered at 243. Up to 154 of these households however generated power using fossil fuels as well hence selection precluded such households, reducing the frame for selection to 89 households. Taro Yamane's sample size determination technique calculated sample size (*n*) of 73 to be selected from the 89 households solely powered by the solar energy hub for homes (precision level set at 0.05).

We randomly selected 73 subscribers into the treatment group from four communities in a district whereas 219 non-electrified households were randomly assigned from four communities in another district of the state. We collected primary data on household socioeconomic characteristics, health-related expenditure, academic performance of relevant members, fuel expenditures, lighting hours, quality of lighting among others. We then constructed a Personal Well-Being Index which was consequently used to track the wellbeing of the respondent households. Data generated were analysed with descriptive statistics, t-test, propensity score matching (PSM), and probit regression model.

**Results**

**100 – 250 words**

Most (69.41%) households were male-headed with mean age 48.59years and sparsely educated. Average years of schooling of 5.64 (adopters) and 6.13 (non-adopters) observed for the respondents were higher than the national average of 5.2 reported on UNDP's Human Development Reports. With about 8 individuals, average household size was larger than the national average of 5.9 persons. Respondent households had between 4-5 school-aged children living in them. The non-adopter households had more incidences of respiratory-related ailments than adopter households (11.68 and 6.62 days respectively). The Average Treatment Effect analysis shown that adopter households were 8.7095 times better off in wellbeing than non-adopters ( $p < 0.05$ ). From the probit regression, at 5% significance level, we found household income ( $2.254e-05$ ), remittance received by household (0.6998), number of school-aged children within-household (0.2276), flexibility in payment (0.7128), subsidy scheme availability ( $5.134e-05$ ), spatial peer effect (0.539), and pursuit of life ease (0.106) increased the probability of adopting solar-powered hub for homes in the study area. Increase in age ( $-0.0472$ ), proximity to town ( $-0.0033$ ) and access to fossil fuels ( $-0.0117$ ) decreased the probability of adoption. The role of income as a determinant of adoption is unclear, having found one unit increase in household income increased the probability of adoption by a factor



of 2.254e-05 which appears to be low, pointing to its ambiguity. Although income provides a socio-economic level that allows adoption decision to occur (Graziano and Gillingham,2014), it well remains a clearly complex variable which can interact to dictate, in the first place, whether a household needs such technological intervention.

**Discussion and Conclusion**

**100 – 250 words**

We conclude that adopting the solar energy powered hub for homes has indicated to generally increase the wellbeing of rural farming households, hence efforts should be geared towards its diffusion. Given that the wellbeing of individuals aggregates and culminates into a peaceful and safer environment and ultimately improves the national wellbeing, it becomes important to investigate the opportunities that abound in the generation of cleaner, cheaper and green energy from solar energy. We, therefore, recommend that government and policymakers should put interventions in place to subsidize the cost of the technology hence making it more affordable to rural households that may be off the national grid or generally lacking in electricity supply.

It is also becoming pertinent for distributors and marketers of this technology to extend their reach to hinterlands where people gain increased awareness on its availability and accessibility. An approach towards diffusing this technology may involve getting key individuals in each locality convinced on the benefits of the solar energy powered hub for homes. Subscription by such key individuals has ways of influencing peers to, as well, adopt in the vicinity. The relevance of this technology cannot be overemphasized in terms of nipping energy crunch in Nigeria in a cleaner, greener and more sustainable manner.