ROLE OF MICRO-FINANCE INSTITUTIONS ON ADOPTION OF HOME SOLAR SYSTEMS IN KENYA: A CASE STUDY OF CHEPALUNGU SUB-COUNTY

[1*] Edwin Makiche
[1]MDS Student: The Management University of Africa
[*]Corresponding Author's Email: emakiche@gmail.com
2* Dr. Juster Nyaga
[2] Management University of Africa
[*]Corresponding Author's Email: jnyaga@mua.ac.ke

The objective of this study was to examine the role of microfinance institutions on adoption of home solar systems in Kenya and the specific objective was to establish the role of awareness campaigns on adoption of home solar systems in Kenya. The results will provide valuable information for MFIs to enhance their services and provide actionable suggestions for improving the accessibility and affordability of the solar home systems. In this study the Financial Inclusion Theory, Rational Choice Theory and the Social Cognitive Theory were used with the anchor theory being the Financial Inclusion Theory. The study was conducted using a descriptive research design, with a target population of 8511 household heads and a sample size of 382 where stratified random sampling was adopted. Data was collected using questionnaires and analysed using descriptive and inferential statistics with the help of SPSS. The findings showed that awareness campaigns has a significant impact on adoption of home solar systems. The study recommends that microfinance institutions should use leveraging community events, local media, and partnerships with influential local stakeholders to increase visibility and encourage positive attitudes toward Solar Home System

1. INTRODUCTION

Solar power capacity in the US increased by 17% to 8775 MW in 2017, according to the Solar Energy Industries Association (2017). A study conducted by the Solar Energy Industry. The Renewable Energy Global Status Report (2019) highlights the top five renewable energy investor economies and the top five states based on their renewable energy capacity and investment. Emerging economies like Turkey, the Philippines, Indonesia, China, and Brazil have heavily invested in various renewable energy sources, including solar.

The energy sector in Africa faces various challenges, that include poor infrastructure, over-reliance on traditional energy sources, low purchasing power, low investments in the sector and insufficient access to modern energy services (Best, 2023). Projections indicate that by 2030, more than 60% of individuals in Sub-Saharan Africa will continue to lack access to electricity (Kundu & Ramdas, 2022). Despite the associated environmental, social, and health challenges, many poor communities continue to depend on traditional biogas as their primary energy source, constituting 70-90% of the primary energy supply in specific economies and accounting for around 86% of energy consumption (Audu & Adamu, 2022; Ojong, 2021).

Solar home systems in Kenya have gained prominence as a decentralized solution to rural electrification, addressing energy poverty in off-grid areas (Opiyo, 2019). These systems, which typically include solar panels, batteries, and LED lights, provide households with clean, reliable energy for lighting, phone charging, and small appliances (Takase, Kipkoech & Essandoh, 2021). The adoption of SHS has been driven by declining solar panel costs, mobile payment innovations like pay-as-you-go (PAYG), and supportive government policies (Mukoro, Sharmina & Gallego-Schmid, 2022). Despite their benefits, challenges such as high initial costs and maintenance issues persist, necessitating further investment and policy interventions (Opiyo, 2019).

The government, in partnership with the World Bank, rolled out an ambitious rural electrification program dubbed 'last mile connectivity in the entire 47 counties in Kenya. In spite of all the progress in connecting part of the population to electricity, 68% of Kenyans living in rural and informal areas still use biomass as their primary energy source of energy. For example, 64.7% of households use firewood, 19% use charcoal, and 10% use agricultural wastes for domestic needs such as cooking and heating, especially in Narok County (Takase, Kipkoech & Essandoh, 2021).

Middleton (2018) asserts that reliance on kerosene as a source of lighting has an adverse influence on learners due to smoke that 'inconveniences children from attending to their homework' as smoke causes eye irritation and health challenges.

Bomet is among the counties with the least connection to electricity at 10.6 percent against the national average of 20 percent (KNBS, 2020). Chepalungu sub-county remains the least connected among the 5 sub-counties in Bomet.

. Even though the private sector has been involved since the 1980s, solar goods became more affordable with the introduction of the pay-as-you-go model in 2011. Today, nearly 30% of off-grid households use these products, positioning Kenya as a leader in this field. This study measured awareness campaigns through seminars, social media posts, broadcasts and written material on solar home systems.

1.1 Awareness Campaigns

The adoption of SHS by households is significantly influenced by their level of awareness and knowledge (Sarin, Gupta & Jituri, 2018). Therefore, it's crucial to provide households with sufficient information and education regarding the benefits and drawbacks of renewable energy technologies (Guta, 2017). This awareness-building process aims to ensure that individuals have a comprehensive understanding of how SHS can positively affect their lives and the environment. Additionally, the insufficient knowledge within households about the harmful health impacts linked to the ineffective burning of solid fuels hinders the expansion of the clean energy sector (Cross & Murray, 2018). Traditional cooking techniques using solid fuels like wood or charcoal may persist in families due to a lack of knowledge about the health dangers associated with these methods, even while cleaner options like solar energy are available.

Ali, Yan, Irfan, Hussain, and Arshad (2023) highlight the importance of Sustainable home systems in promoting economic development and poverty alleviation. They identified barriers to SHLS adoption in Pakistan and recommended strategies like maintenance, government subsidies, owner satisfaction, and social media awareness. Odai, Majeed, Alaaba, Alhassan and Fuseinii (2023) suggest that incorporating social media campaigns into marketing strategies can enhance brand choice awareness, establish rapport with the target audience, and foster partnerships. Even with the Kenyan government's attempts to widen the electricity network, 80% of the populace remains without access. Solar lanterns and home systems that are off-grid have become increasingly popular, offering clean energy solutions

1.2 Statement of the Problem

Opportunities in the solar energy sector in Kenya are substantial, which can attract investments, help alleviate poverty, and promote sustainable economic growth, provided that households widely adopt solar home systems. However, there are still significant barriers that a lot of people face when they want to use green energy. According to data compiled by the Ministry of Energy, biomass, which mostly consists of firewood and charcoal, accounts for around 68% of the overall energy consumption, while petroleum accounts for 22%. Having restricted energy availability is connected to problems like poverty, environmental decline, health hazards and susceptibility to economic downturns related to relying on imported oil (Hellqvist, 2021).

Kenya’s government, in partnership with the World Bank, rolled out an ambitious rural electrification program dubbed 'last mile connectivity in the entire 47 counties in Kenya. In spite of all the progress in connecting people to electricity, 68% of Kenyans living in rural and informal areas still use biomass as their primary energy source. For example, 64.7% of households use firewood, 19% use charcoal, and 10% use agricultural wastes for domestic needs such as cooking and heating, especially in Narok County (Takase, Kipkoech & Essandoh, 2021). Middleton (2018) asserts that reliance on kerosene as a source of lighting has an adverse influence on learners due to smoke that 'inconveniences children from attending to their homework' as smoke causes eye irritation and health challenges. Bomet is among the counties with the least connection to electricity at 10.6 percent against the national average of 20 percent (KNBS, 2020). Chepalungu sub-county remains the least connected among the 5 sub-counties in Bomet. According to the Bomet County Integrated Development Plan (CIDP 2023-2027), only 30 percent of the population in the Chepalungu sub-county is connected to the national grid, while 70 percent of the population uses biofuel for cooking and lighting purposes.

There is paucity of literature on role of micro-finance institutions and SHS adoption. Anugwom, Anugwom and Eya (2020) identified annual energy costs as a major barrier to clean energy adoption among urban families but did not examine the role of microfinance institutions in SHS adoption, hence conceptual gap. Ngonda (2022) found that SHS adopters in sub-Saharan Africa were typically skilled, educated and affluent, but the study was a systematic review hence a methodological gap. Aarakit et al. (2021) analyzed factors influencing solar technology adoption and highlighted the importance of flexible payment mechanisms, rural location, income, and dwelling type. However, Aarakit et al.'s study was conducted in Uganda, presenting a contextual gap. The proposed study will address these gaps by collecting primary data on the role of MFIs in SHS adoption in Chepalungu Sub-County, Bomet County.

1.4 Objective

i. To evaluate the effect of awareness campaigns on adoption of SHS in the Chepalungu sub-county

2. LITERATURE REVIEW

2.1 Financial Inclusion Theory

The financial inclusion theory was developed by Ozili (2020). Financial inclusion occurs when all people may easily and affordably access a range of financial goods and services. It is essential that businesses requiring financial services to fulfill their needs can easily and affordably access them; otherwise, it indicates a state of financial exclusion. It is the study's anchor theory as it encompasses the critical role the MFIs play in acquisition of SHS. MFIs are financial institutions, which focus on the underserved populations, majorly in the rural areas. Through financial inclusion, the populations are able to access the solar home systems, which they would otherwise not have accesses using the traditional bank and other financial institutions. Financial inclusion may be either voluntary or involuntary, but all those who voluntarily require such services should be able to obtain them when needed. Ozili (2020) argues that the current state and practice of financial inclusion in the modern financial sector lack a comprehensive theoretical foundation that would provide a deeper understanding and achievement of its objectives.

Furthermore, the theory's proponent advocates for the development of three categories of financial inclusion theories: theories concerning the beneficiaries of financial inclusion, which address the question of who should be the primary targets of specific financial inclusion initiatives; theories regarding the delivery of financial inclusion, which explore whether the government or the private sector should take the lead role in delivering financial inclusion objectives to the population; and theories concerning the funding of financial inclusion, which examine whether funding for achieving financial inclusion goals should primarily come from public sources or capital markets (Ozili ,2020). The theory has been criticized as financial inclusion often overlooks the link between poverty and poor decision-making, which can hinder it. Poor individuals often prioritize the present over the future, leading to financial inclusion. This shift in focus from money to finance has led to financial inclusion becoming a primary source of happiness. However, some argue that the benefits of financial inclusion may diminish over time (Ozili ,2020).

The financial inclusion theory is applicable to this study. Financial inclusion theory posits that individuals and communities' benefit from access to credit. Microfinance institutions facilitate access to financing for individuals who may not have the necessary upfront capital. Microfinance institutions can develop loan products with flexible terms and repayment schedules to accommodate the unique financial circumstances of borrowers interested in adopting solar energy solutions. Additionally, microfinance institutions can offer financial literacy training to help borrowers understand the financial implications of investing in SHS and manage their loan obligations effectively. The idea of financial inclusion acknowledges that people and communities may need more than just access to financial services to become economically self-sufficient.

Technical assistance and capacity building are essential components of promoting sustainable financial inclusion. In the context of SHS adoption, microfinance institutions can provide technical assistance to borrowers, helping them assess their energy needs, choose appropriate solar products, and understand how to operate and maintain the systems effectively. Capacity building initiatives can also include training programs on energy efficiency and income-generating activities linked to solar energy (Ozili ,2020). Financial Inclusion Theory is critiqued for oversimplifying complex financial behaviors and interactions. It often assumes that access alone leads to usage, neglecting barriers like financial literacy, cultural attitudes and socio-economic factors that significantly influence individuals' engagement with financial services.

Financial inclusion theory highlights the importance of partnerships among stakeholders to address systemic barriers to financial access and inclusion. Microfinance institutions can forge partnerships with government agencies, non-

profit organizations, renewable energy companies, and community-based organizations to enhance the reach and effect of their initiatives promoting SHS adoption. These partnerships can facilitate access to technical expertise, market knowledge, and funding sources, further supporting the goal of expanding financial inclusion through sustainable energy solutions.

2.2 Rational choice theory

The theory was introduced by the neo-classical economist Adam Smith in 1776,it posits that individuals mainly behave in a self-interested manner to maximize their own gains. This theory provides understanding into how individuals and institutions make decisions by showing how they choose the most beneficial options. Awunyo (2018) suggests that this rational theory is applicable in understanding the demand for financial services, encompassing the inclination towards such services, the characteristics of services provided by financial institutions, and the prerequisites for their provision. According to Awunyo (2018), these factors significantly shape the selection of financial services pursued by individuals. The theory posits that institutions opt for choices aligning with their objectives amid various uncontrollable influences, thereby serving as a mechanism for cost-benefit analysis to determine the most favorable outcomes. However, criticisms have been leveled against the theory for its failure to acknowledge that the success of the 'optimal choice' is also subject to external factors beyond the decision-maker's control. Rational Choice Theory has several weaknesses, including its assumption that individuals always act rationally, ignoring emotional, social, and cultural influences. It oversimplifies decision-making by focusing on self-interest and utility maximization, often failing to account for altruism or irrational behavior (Awunyo ,2018).

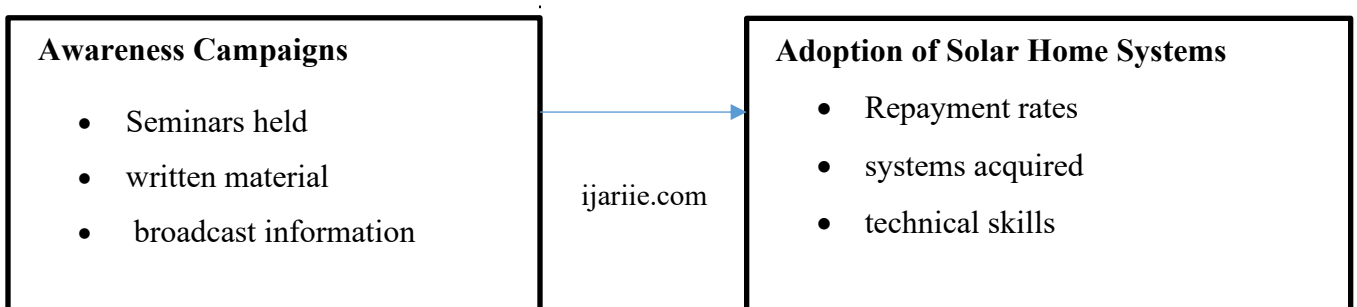
This study can utilize rational choice theory which proposes that individuals consider the pros and cons of various choices. When people decide to use solar home systems, they evaluate factors such as upfront costs, continuous upkeep costs, and the possible reduction in energy expenses. Microfinance awareness campaigns can influence individuals' perceptions of the benefits outweighing the costs. Rational choice theory emphasizes the importance of information in decision-making. Microfinance awareness campaigns often aim to educate communities about various financial options and opportunities. Awareness campaigns can increase awareness and understanding among individuals who might not have previously considered solar energy due to perceived financial barriers. Rational choice theory acknowledges that individuals' choices are constrained by their access to resources. For low-income families, the initial investment required to buy SHS might be rather high. Microfinance institutions can address this barrier by offering loans tailored to enable the purchase of solar energy systems.

2.3 Social cognitive theory

It was proposed by Albert Bandura in 1986. It is based on self-efficacy, which is how confident someone feels about their skills in using technology for a particular task or role. The concept is based on perceived self-efficacy – beliefs about one's ability to both plan and carry out actions required to reach desired performance levels (Bandura, 1986). In this model, it is believed that looking ahead is extremely important in influencing human drive and actions. The theory focuses on various important factors that impact behavior, such as expectations related to the results of specific actions. Self-efficacy, a key component of social cognitive theory, refers to individuals' belief in their capability to carry out the tasks required to reach desired outcomes (Abdullah, 2019). Another crucial factor is anticipation of results, centering on individuals' beliefs about the consequences of their behavior. The theory also includes objectives, obstacles, and supporters. This framework is especially important for this study because it will increase understanding of solar energy usage and provide understanding of how participants perceive the results of utilizing solar energy (Mulhollem ,2017). A weakness of social cognitive theory is its complexity, making it challenging to apply and measure. Additionally, it may overemphasize cognitive factors while underestimating emotional and environmental influences. The social cognitive theory links to solar home system adoption by emphasizing self-efficacy, where individuals' confidence in using solar technology influences their decision-making, behavior, and expectations of successful outcomes

2.4 Conceptual framework

Independent Variable **Dependent Variable**



3. METHODOLOGY

The study employed a descriptive research design. As Siedlecki (2020) explains, this approach involves analyzing and observing study variables in their original, unaltered state without any intentional changes.

The target population for the study was 8511 household heads from five wards of Chepalungu sub-counties as shown in table 1 below

Table 1: Target population

Ward	Population
Siongiroi	2002
Sigor	2183
Chebunyo	1472
Nyangores	1271
Kong'asis	1583
Total	**8511**

Source: County Government of Bomet (2024)

The study used stratified random sampling with a sample with a sample size of 382 derrived from Yamane (1973) formula. . All five of Chepalungu Sub-County's microfinance institutions' branch managers were randomly selected for a census sampling. Table 2 displays the number of participants in the sample: -

Table 2: Sample size

Ward	Population	Sample
Siongiroi	2002	90
Sigor	2183	98
Chebunyo	1472	66
Nyangores	1271	57
Kong'asis	1583	71
Total	**8511**	**382**

Questionnaires underwent a verification process for accuracy and consistency. The data was cleaned and analyzed by tabulating, coding and editing to find out whether there were any outliers in the answers. A unique numerical number was given to each response for the purpose of subsequent analysis. Data analysis involved utilization of SPSS. Both inferential statistics and descriptive statistics were adopted for analysis. Correlation and regression analysis, which are forms of inferential statistics, were used to evaluate connections among study variables.

4 RESEARCH FINDINGS AND DISCUSSION

A total of 382 questionnaires were given out to heads of households, out of which 353 were completed and returned. Shiyab et al (2023) suggest that response rates of 50% or higher are suitable for analysis. Therefore, the study achieved an optimal, acceptable and dependable overall response rate of 92%. The summary of results are shown in table 3 below

Table 3: Response Rate

Response rate	Frequency	Percentage
Response	353	92
Non response	29	8
Total	**382**	**100**

Source: Author (2025)

4.1 Descriptive Statistics

Effect of awareness campaigns on adoption of solar home systems

The second objective was to analyze the effects of awareness campaigns and adoption of solar home systems. Respondents were asked five questions regarding effects of awareness campaigns and adoption of solar home systems. A Likert scale was used to display the responses.

Table 5 displays the summary of the research participants' responses: -

Table 5: Effect of awareness campaigns on adoption of solar home systems

STATEMENTS	n	mean	Std.D
Awareness campaigns conducted by microfinance institutions significantly contribute to increasing public knowledge about the benefits of SHS.	353	4.57	0.551
Microfinance awareness campaigns play a crucial role in motivating households to consider investing in solar home systems	353	4.33	0.580
The effectiveness of microfinance awareness campaigns influences my likelihood of exploring solar energy options for my home.	353	4.52	0.500
I perceive microfinance institutions' efforts in raising awareness about SHS as essential for promoting sustainable energy practices	353	4.33	0.554
The outreach efforts of microfinance institutions significantly influence public's perception and acceptance of SHS as a viable energy solution.	353	4.36	0.628
Aggregate mean		**4.42**	**0.563**

Aggregate mean of 4.42 indicates a high level of agreement among participants on positive effect of awareness campaigns on adoption of SHS. The aggregate SD of 0.563 is relatively low, showing consistency in the responses.

4.2 Regression Analysis

Table 9: Model Summary for awareness campaigns

R	R Square	Adjusted R Square	Std. Error of the Estimate
.551[a]	0.30	0.30	0.19

a. Predictors: (Constant), awareness campaigns

Regression model results in Table 10 reveal a moderate positive relationship between awareness campaigns and the adoption of SHS, with an R value of .551. R^2 value of 0.30 means that 30% of the variance in SHS adoption may be explained by awareness campaigns only.

Table 10: Analysis of variance for awareness campaigns and adoption of solar home systems

	Sum of Squares	df	Mean Square	F	Sig.
Regression	5.802	1	5.802	153.414	.000[b]
Residual	13.274	351	0.038		
Total	19.075	352			

a. Dependent Variable: adoption

b. Predictors: (Constant), awareness campaigns

ANOVA results in Table 11 show that the model assessing the effect of awareness campaigns on the adoption of SHS is statistically significant, with an F-value of 153.414 and a p-value of .000, indicating that awareness campaigns are a significant predictor of SHS adoption.

Table 11: Coefficients for awareness campaigns and adoption of solar home systems

	Unstandardized Coefficients	Std. Error	Standardized Coefficients	t	Sig.
(Constant)	2.470	0.150		16.494	0.000
awareness campaigns	0.418	0.034	0.551	12.386	0.000

a. Dependent Variable: adoption

The coefficients table indicates that awareness campaigns have a positive and statistically significant effect on adoption of SHS. Unstandardized coefficient for technical assistance is 0.418 (p = 0.000), suggesting that for each unit increase in technical assistance, SHS adoption increases by 0.418 units. The t-value of 12.386 further confirms the strength of this relationship. The constant ,2.470, represents the expected level of SHS adoption when awareness campaigns is zero, and explains that awareness campaigns is a significant predictor of SHS adoption.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions

Awareness campaigns led by microfinance institutions play a vital role in increasing public understanding of the advantages of solar energy. Awareness campaigns encourage more people to consider solar as an alternative to conventional energy sources. The heightened awareness helps shift public perception, positioning solar energy as a reliable and accessible option. As people gain insights into the long-term financial and ecological benefits, they become more open to investing in solar home systems. Moreover, these campaigns highlight the importance of sustainable practices. Consequently, awareness campaigns by microfinance institutions not only promote solar adoption but also support environmental sustainability.

5.2 Recommendations

Leveraging community events, local media, and partnerships with influential local stakeholders can help increase visibility and encourage positive attitudes toward SHS. Strengthening partnerships between microfinance institutions, solar energy providers, government agencies, and NGOs can create a comprehensive support network that addresses financial, technical, and awareness barriers to SHS adoption. Such partnerships should also focus on advocacy and policy support to establish a conducive regulatory environment for SHS growth.

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