

Expanding Women's Role in Africa's Modern Off-Grid Lighting Market



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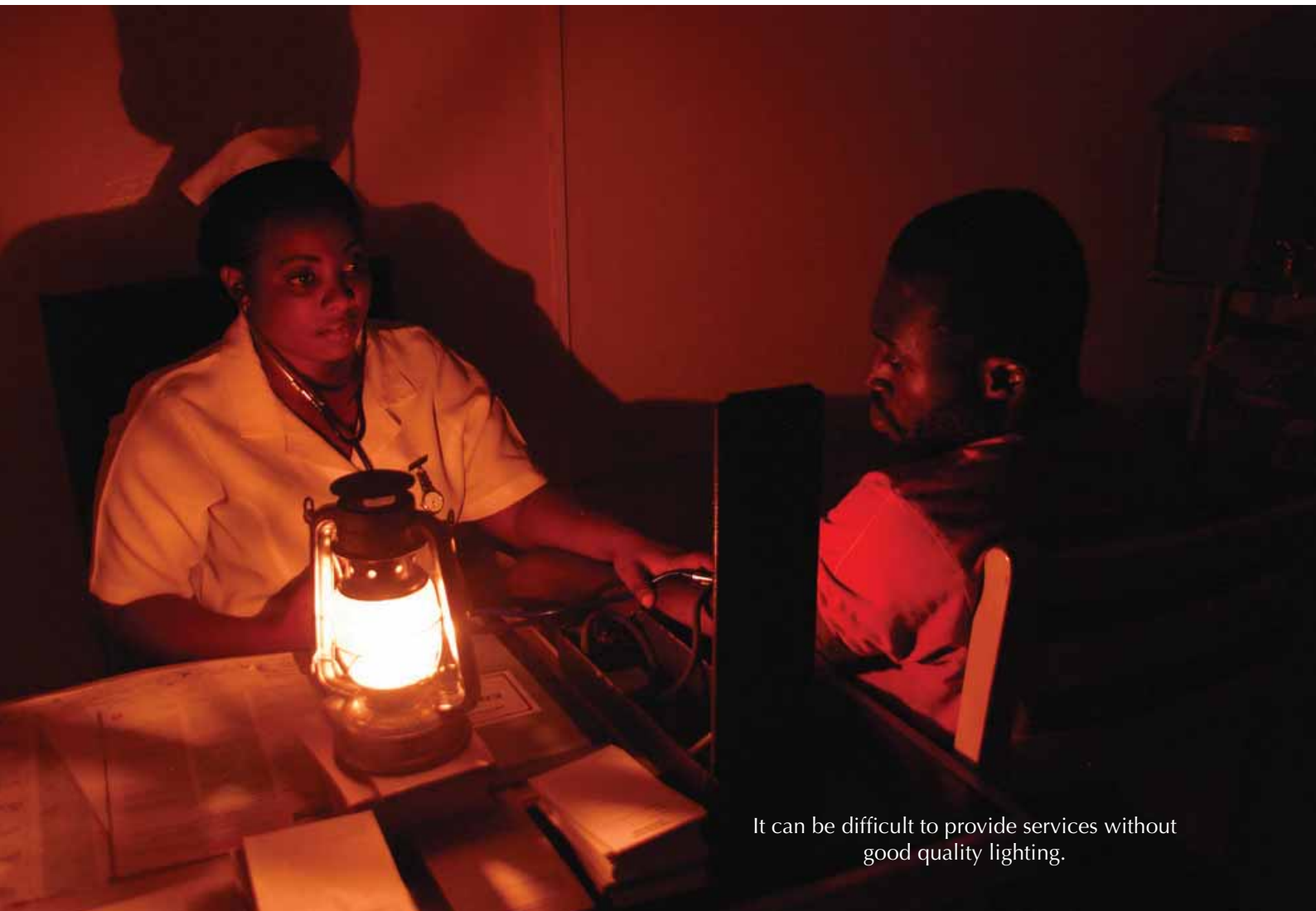
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It can be difficult to provide services without good quality lighting.

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<http://www.lightingafrica.org>

About Lighting Africa

Lighting Africa, a joint IFC and World Bank program, seeks to accelerate the development of commercial off-grid lighting markets in Sub-Saharan Africa as part of the World Bank Group's wider efforts to improve access to energy. Lighting Africa is helping mobilize the private sector to build sustainable markets to provide 2.5 million people with safe, affordable, and modern off-grid lighting by 2012. The longer-term goal is to eliminate market barriers for the private sector to reach 250 million people in Africa without electricity, and using fuel-based lighting, by 2030.

Improved lighting provides significant socio-economic, health and environmental benefits such as new income generation opportunities for small businesses. Lighting Africa is a key element of the global Solar and LED Energy Access (SLED) program, an initiative of the Clean Energy Ministerial. For more information, visit www.lightingafrica.org

Lighting Africa is implemented in partnership with: The Africa Renewable Energy and Access Grants Program (AFREA), the Asia Sustainable and Alternative Energy Program (ASTAE), the Energy Sector Management Assistance Program (ESMAP), the Global Environment Facility (GEF), Good Energies, Italy, Luxembourg, the Netherlands, Norway, the Public-Private Infrastructure Advisory Facility (PPIAF), the Renewable Energy and Energy Efficiency Partnership (REEEP), and the United States.

About IFC

IFC, a member of the World Bank Group, is the largest global development institution focused exclusively on the private sector. We help developing countries achieve sustainable growth by financing investment, providing advisory services to businesses and governments, and mobilizing capital in the international financial markets. In fiscal 2011, amid economic uncertainty across the globe, we helped our clients create jobs, strengthen environmental performance, and contribute to their local communities—all while driving our investments to an all-time high of nearly \$19 billion. For more information, visit www.ifc.org.

IFC's Women in Business (WIN) program is housed within Sustainable Business Advisory and from there initiatives and programs are promoted that seek to leverage business opportunities from taking a gender view women in business across all advisory and investment services. A suite of IFC investment and advisory services has been developed in this context to increase access to finance and access to markets for women entrepreneurs, reduce gender-based barriers in the business environment, and create business opportunities built around improved working conditions for women employees. For more information, visit www.ifc.org/gender.

About the World Bank

The World Bank is a vital source of financial and technical assistance in developing countries worldwide, with a mission to help reduce global poverty and improve living standards. However, it is not a bank in the common understanding of the term. Rather, it is comprised of two unique development institutions owned by 185 member countries – the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA). Each institution plays a different but supportive role.

The IBRD focuses on middle income and creditworthy poor countries, while IDA focuses on the poorest countries in the world. Together, they provide low-interest loans, interest-free credit, and grants to developing countries for education, health, infrastructure, communications, and many other purposes. The World Bank concentrates on building the climate for investment, jobs, and sustainable growth to enable economies to grow, and investing in and empowering poor people to participate in development. For more information, visit www.worldbank.org.

Executive Summary

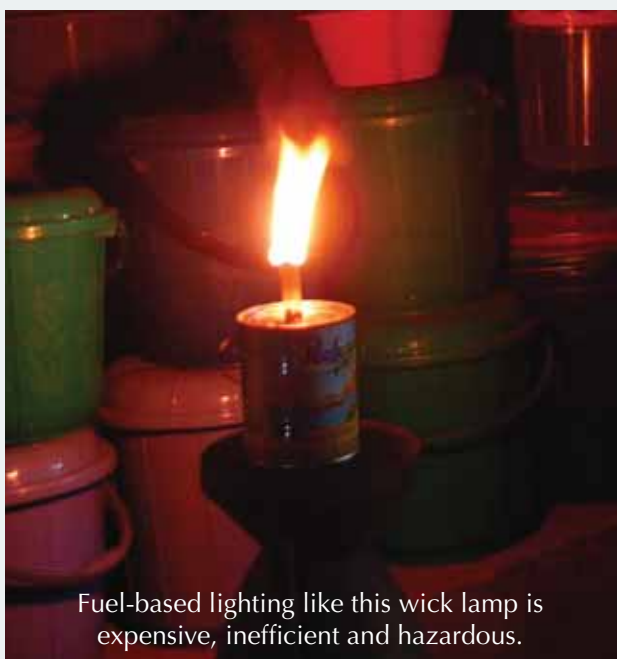
Lighting is a basic human need and, along with cooking, is a fundamental driver of fuel demand for low-income households in the developing world. Women and men without access to electricity typically rely on expensive, inefficient and hazardous lighting devices like kerosene lamps and candles to bring light to their homes and businesses. The annual spending for fuel based lighting worldwide approaches \$40 billion, and a growing range of modern lighting products that incorporate innovative designs and business models are gaining market share. Modern off-grid lighting devices combine the latest advances in clean energy technology (for example, solar, LED, and advanced batteries) to provide a safe, efficient, affordable alternative to fuel based lighting.

There are widespread efforts to expand access to conventional energy, but unfortunately the expansion of electrification in many places, and particularly in Sub-Saharan Africa, is not keeping pace with off-grid population growth. Infrastructure deficiencies aside, women in those countries sometimes face additional barriers to electrification including requests for bribes and longer waiting times for service.

Adopting modern off-grid lighting can help bridge the energy gap until widespread electrification catches up. It can also provide an additional and reliable lighting source for those serviced by the electric grid, but who face frequent blackouts and intermittent power, which is a common occurrence across much of the African continent. Some lighting products even provide additional services beyond lighting, such as the ability to power small electronics like mobile phones, increasing the value proposition for women.

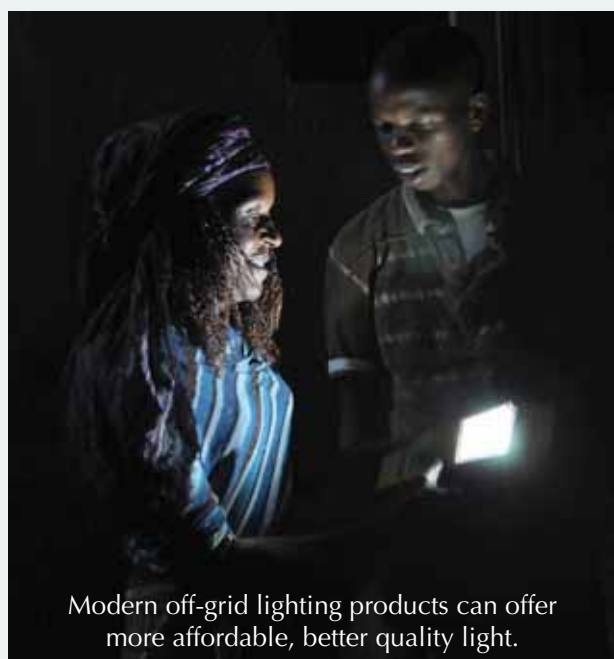
On the household level, women stand to benefit greatly from better lighting and energy access. Entrepreneurial women have a stake as well; modern lighting and communications technology enables them to strengthen their enterprises.

This report focuses on women's role in the expanding market for modern off-grid lighting. In the context of access to energy and lighting, the aim of this work is to identify whether there are any women-specific opportunities in the off-grid lighting market that could enhance product profitability while also improving lives.



Fuel-based lighting like this wick lamp is expensive, inefficient and hazardous.

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Modern off-grid lighting products can offer more affordable, better quality light.

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Drawing on a variety of sources, with a particular emphasis on a Lighting Africa market survey capturing impressions from over 5,000 households and 2,500 small enterprises across five Sub-Saharan African countries (Ethiopia, Ghana, Zambia, Kenya, and Tanzania), **the key findings are:**

Agreement on Preferences: Women and men alike are ready for improved lighting, with small differences related to their respective preferences for particular types of lighting products.

Entrepreneurship: An approach that offers a range of lighting options for different contexts and needs is warranted for women and men alike. In the small business sector, there are indications that women who use off-grid lighting have slightly different preferences than men; the types of businesses women tend to operate drive these preferences.

Key Buyers: Women hold significant sway in household decisions related to the purchase of lighting technology (20-50% depending on the country, ~35% across the five countries), which underscores the importance of reaching women with marketing and educational messages.

Health Concerns: Increased awareness of the indoor air pollution health risks caused by fuel based lighting is stimulating demand for clean alternatives in many countries. The issue could be used as a key message in marketing and consumer education campaigns.

Financing Gap: Access to finance – with a focus on women’s finance – is a key to the development of the off-grid lighting market. Financing opportunities and frameworks are often different for women than for men with opportunities for women often relying more on informal networks and lending groups.

Meeting women’s needs with modern off-grid lighting technology will require stakeholders across the value chain to take action.

For manufacturers and distributors:

- Evaluate your approach to selling to women; they are a significant part of the market and have decision-making power.

- Partner with and support women’s formal and informal networks, particularly for financing but also for marketing and outreach, to enable consumers to purchase your products.

- To drive demand, consider including messages about avoided smoke inhalation, an issue for women, men, and children alike.

For governments and development institutions:

- Find ways to support formal and informal financing frameworks to better reach women.

- Explore synergies between improved cook stoves (which are typically woman-centered) and modern off-grid lighting. There may be opportunities to co-market the two products in a way that leverages consumer-level (micro) finance for a multifunctional off-grid energy platform that provides clean cooking, lighting, and potentially other services like mobile phone charging as well.

- Ensure that effective tracking of gender data is part of day-to-day operations, including market surveys, consumer outreach, and program monitoring and evaluation. There are key lessons-learned in this area included in the Annexes.

- At the policy level, identify and address practical solutions to women’s constraints to gain access to off-grid lighting, and in parallel access to the grid. Policies may help support women’s access to electricity (grid and off-grid).

For financial institutions:

- Consider reaching the women’s market through targeted products and services, a specific outreach strategy, and possibly financial and management skills courses.

- Partner with women groups to assist with market outreach and leverage financial risk (for example, group lending, “micro consignment”).

- At the SME level, aid women and men who are distributors/resellers with distributor financing.

- Explore mobile banking and the potential added value of linking mobile technology with off-grid lighting products that can charge mobile phones.

Background: Energy and Development

Nearly one in four people worldwide do not have access to reliable, affordable, modern energy services. Without access, their productivity and economic opportunities are very limited and they face economic and public health hardships from reliance on expensive, dirty fuel-based technology for lighting and cooking.

In Sub-Saharan Africa, an estimated \$10 billion is spent annually on hazardous and low quality fuel based lighting products, providing little value in return.ⁱ Fuel based lighting is not only expensive, but contributes to inordinate levels of greenhouse gas (GHG) emissions, indoor air pollution (IAP), and is a fire hazard.

Additionally, nearly half of the world's households cook daily with wood, crop residues and untreated coal.ⁱⁱ Women often bear the difficult and sometimes dangerous responsibility of collecting fuel wood. Open fires and unimproved cookstoves are also the leading source of exposure for many women and children to unhealthy indoor air pollution (IAP), which can lead to acute respiratory infections among other ailments. Globally, IAP is responsible for an estimated 2 million deaths annually. Fuel based lighting can lead to significant levels of exposure as well, and is the number two source of IAP in developing world households.ⁱⁱⁱ

While grid extension and expanded access to modern energy are increasing in many countries around the world and resulting in significant improvements in human development, the case in Sub-Saharan Africa is akin to demand outstripping supply: electrification efforts cannot currently compete with population growth, resulting in a smaller and smaller percentage of the population that is actually being served by the electric grid. The rising population of over 590 million off-grid women and men in Africa presents both an enormous challenge and opportunity.

One way to improve living conditions is to increase access to clean and reliable off-grid alternatives until grid expansion catches up with population growth and the quality of grid-based electricity access improves (for instance, with reduced initial connection costs, improved reach, fewer service interruptions and better quality power). Herein lies the importance and opportunity of the modern off-grid lighting market, and the part of the rationale behind the market acceleration interventions offered by the Lighting Africa Program, which acts as a catalyst to support private sector development of commercial markets for quality modern lighting.

Fuel-based Off-Grid Lighting Technology

Fuel based lighting includes a range of technologies, some of which are pictured here. These include relatively clean burning and very bright pressurized lamps, hurricane lamps that have a glass globe around the wick, tin lamps that have uncovered wicks and are often manufactured "locally" out of reclaimed containers, and candles. Kerosene is the most common liquid fuel, but others like diesel are sometimes used.



Pressure Lamp

Hurricane Lamp

Tin Lamp

Candle

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Modern Off-grid Lighting Technology comes in a variety of designs:

Fixed Indoor Products with Multiple Light Points. Among off-grid lighting products, fixed indoor products with multiple light points are some of the most costly but also provide high levels of lighting service. These lights have a central battery pack, a solar panel with a long cord so that the panel can be put outside to charge, and multiple light points that can be distributed around the house wherever they are needed. Often, one can also charge a mobile phone or listen to the radio using the product, adding valuable additional energy services.



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Portable Products with external solar modules: These lights include the battery in the same package as the light source, making them portable. Like many modern solar lighting products, the batteries can often alternatively be recharged with grid power. Some models also include the ability to recharge mobile phones. Some portable products have a fixed LED, while others include a gooseneck.



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Flashlight. Flashlights (also known as torches) can be recharged with either integrated solar modules or via grid power. Levels of quality vary greatly in this segment. Many low-cost, poorly made LED flashlights dominate the options available in the marketplace. The presence of these low-quality LED lights has the potential to lead to market spoiling for the other segments of LED lighting as well, which could pose an imminent threat to development of the sector.



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Gender Dimensions

The role of women in the energy sector of the developing world is often overlooked or misinterpreted. This is often due to a lack of information, awareness, and tangible action plans for development institutions and the private sector alike. This report aims to push forward the conversation about filling those gaps for the off-grid lighting market.

The evidence of the impacts of electricity access on households (especially by gender) is scattered, shallow, and patchy with a persistent lack of advanced planning for careful impact evaluations. There is great predominance of “gray literature” dealing with energy-gender relationships but few rigorous impact evaluations.^{iv} Most research that has been done on gender and energy, including on lighting, suggests men and women have different access to energy resources, with gender-differentiated impacts at the individual, household, and community levels.

A number of good reports on gender and energy have been issued in the last decade by Elizabeth Cecelski, a researcher with ENERGIA, the international network

on gender and sustainable energy. Some excerpts from Cecelski’s work are highlighted below:

“Energy policy and practice have moved in the past decades from a focus purely on technical supply issues (i.e., how to extend the lines and build the power plants) to embrace a broad range of new approaches. Rising concerns over the relationships between energy and environment have led to more focus on the role of energy consumers, socio-economic factors in technology adoption, and impacts on people. Now that people are more part of the energy equation, women are becoming more visible too.”^v

Research by Cecelski also delved into household dynamics:

“...women and men often show a considerable difference in their perception of benefits of new energy technology. For example, in India where the different perceptions were analyzed with regard to use of biogas, men were more concerned about faster cooking and timely meals, while women attached considerable importance also to the smoke-free environment in the kitchen and other associated health benefits. These differing perceptions are not necessarily in conflict; women’s and men’s interests in uses of energy tech-

nologies may complement one another. Nonetheless, these differences have implications for end uses and marketing.”^{vi}

In a 2004 study, Douglas Barnes used an Energy Sector Management Assistance Programme (ESMAP) Energy Survey to explore the effect of electrification on women’s lives in rural India.^{vii} The study indicates that electrification reduced the amount of time spent by women on household chores and increased their leisure time; “Compared to women in households without electricity, they (women in households with electricity) spend less time collecting fuels, fetching water, and cooking, and instead spend more time on earning an income, reading, and watching television”. The survey results also indicated that electrification increased the time women spent on reading through the day; “... it would seem that high quality lighting, made possible by having electricity, makes it more likely that women will read in the evening regardless of their income class although the amount of time spent reading

does seem to increase with income.”

In another field study, René Massé reported in an “Energy, Poverty and Gender (EnPoGen) Study in Sri Lanka” that electrification reduced the time women spent on household activities, which resulted in increased leisure time shared with their families.^{viii}

In spite of the benefits of electrification, due to various socio-economic reasons women are often disadvantaged in the energy access equation. Studies have shown that women have lower access to finance and energy-related services than men in many African countries. For example, data from the World Bank Group’s Enterprise Survey^{ix} shows that access to grid electricity for women-headed businesses is generally impeded compared to men. In all 5 countries of focus in this report, more woman-operated firms give bribes to secure an electrical connection (Figure 1). Women also often suffer significant delays when trying to

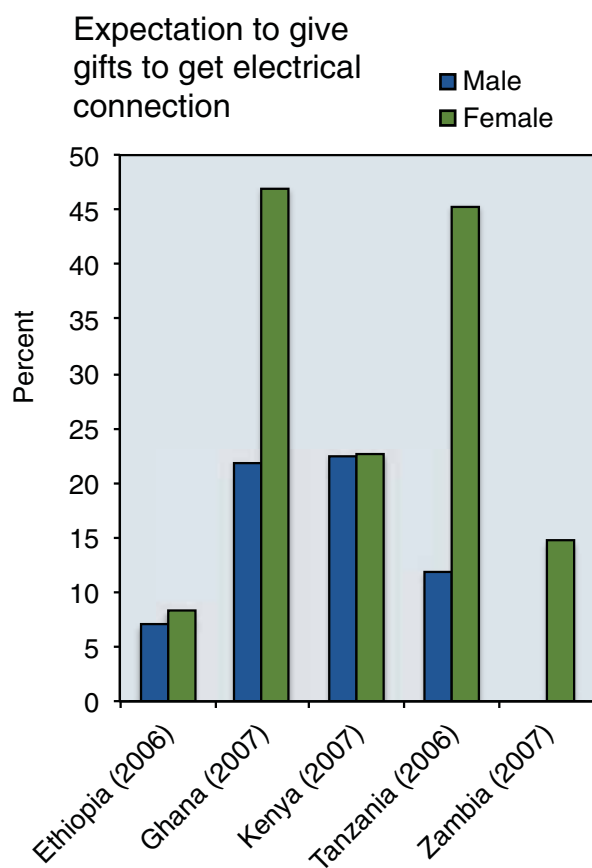


Figure 1: Enterprise survey results: percent of firms expected to give a gift (in other words, a bribe) to get an electrical connection^{xi}

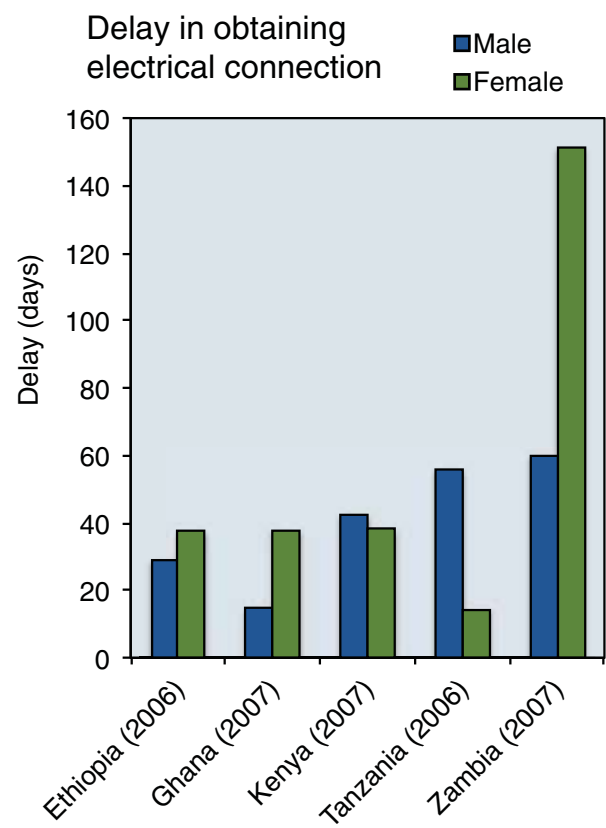


Figure 2: Enterprise survey results: length of wait for obtaining an electrical connection^x

obtain an electrical connection, often (but not always) needing to wait much longer for their electrical connection than men (Figure 2).

Women can take an active role in helping policy makers formulate programs to help increase women's access to electricity (grid and off-grid), and have been doing so for decades. For example, the rural electrification experience in the United States in the early 1930s had a targeted outreach to women. "...the American electricity sector developed itself [successfully] by heavily involving women, in large private utilities as well as in grassroots cooperatives, at the central and regional level, in executive management as well as in field extension." The National Electric Light Association, a private sector organization, encouraged utilities to recruit women—especially women trained in home

economics—in order to promote domestic uses of electricity.^{xiii}

Unfortunately the lessons of the past are not always carried forward. For instance, in a 2002 study focused on Zambia, Chandi found that many energy sector policies did not involve women at the policy formulation level.^{xiii} However, when gender issues were incorporated at the project design stage, the projects that were reviewed had greater end-user acceptability, initiated more income-generating activities, and increased input and output in entrepreneurial activities.^{xiv}

Women are both important beneficiaries and key facilitators of successful energy access programs.

Women are key users of off-grid lighting in the household and stand to benefit from access to modern alternatives.



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Purpose, Objective, and Methods

Given that grid access will remain limited for the foreseeable future in Sub-Saharan Africa and women headed firms face more obstacles in accessing the grid, a women-targeted approach to designing, financing and marketing off-grid lighting products gains special importance.

In the context of access to energy and lighting, the aim of this work is to identify whether there are any women-specific opportunities in the off-grid lighting market that could enhance product profitability and development impacts.

Do women entrepreneurs or women-headed households operate in any way differently to their male counterparts that would inform a different approach for the off-grid lighting market?

This report draws mainly on an off-grid lighting market research dataset collected by Research International at the request of Lighting Africa in 2008.^{xv} The data are focused on five countries, Ethiopia, Ghana, Zambia, Kenya, and Tanzania, with equal emphasis on each. Across the five countries, 5,000 households and 2,500 small enterprises were surveyed with a focus on lighting. Households and businesses from rural and urban areas were randomly chosen and the interviewees were the head or main decision maker. The focus of the survey was off grid households/businesses. The gender of the survey participant did not influence selection of a household/business or the type of questions that were asked during the interview. The raw data are freely available at www.lightingafrica.org.

Additionally, 100 urban and rural households participated in an in-home trial portion of the research that resulted in a deeper understanding of end-user preferences and provided anecdotal support to the larger dataset.

The main goals of the market research were to inform the suitability of different types of lighting market devices, to determine their potential in the African market, to identify the socioeconomic situation, access and use of energy and other services, and to establish general consumer preferences related to lighting.

The data have already been the subject of other works, which reported the following general findings:



“Roughly 80 percent of the households in the countries included in the research are not connected to the electric grid. In total, this leads to approximately 40 million off-grid households in the five countries. Research International identified a total potential demand for modern lighting products greater than 50 million units among them; it is split between several product types and price points. Potential sales to households that are currently connected to the grid are also high due to the poor reliability of grid power in these countries.”^{xvi}

Undoubtedly, women have an important share in this potentially large market for modern off-grid lighting.

Combining the quantitative and qualitative data from market research with supporting information and analysis lead to five key messages about women in the off-grid lighting context. They include insights on preference for lighting, the needs of off-grid entrepreneurs, womens’ decision-making power, health concerns about fuel-based lighting, and the need for financing.

Preferences: Women and men alike are ready for improved lighting, with small differences related to the preferences for types of products.

Overall the market research indicates that both women and men desire higher performance lighting products than those that are currently in use and that modern lighting products will be well received. In the household survey, respondents were asked to name their preferred type of lighting. Solar powered lanterns, light bulbs, and battery-powered lanterns were commonly identified, all of which are modern lighting products (Figure 3). Among the familiar fuel-based lighting products, a paraffin (kerosene) lamp with glass cover was also a popular choice in all the countries except Zambia, reflecting an embrace of the status quo by

some respondents.

Over 30 percent of the household respondents in Zambia, Kenya and Ghana choose a solar lantern as their preferred lighting product. In Zambia and Ethiopia, there was also a strong preference for light bulbs, with around 25 percent of the respondents choosing them as their preferred source of light.

The preferences of women and men respondents were generally similar in all the five countries surveyed. In Kenya and Tanzania women and men preferred paraf-

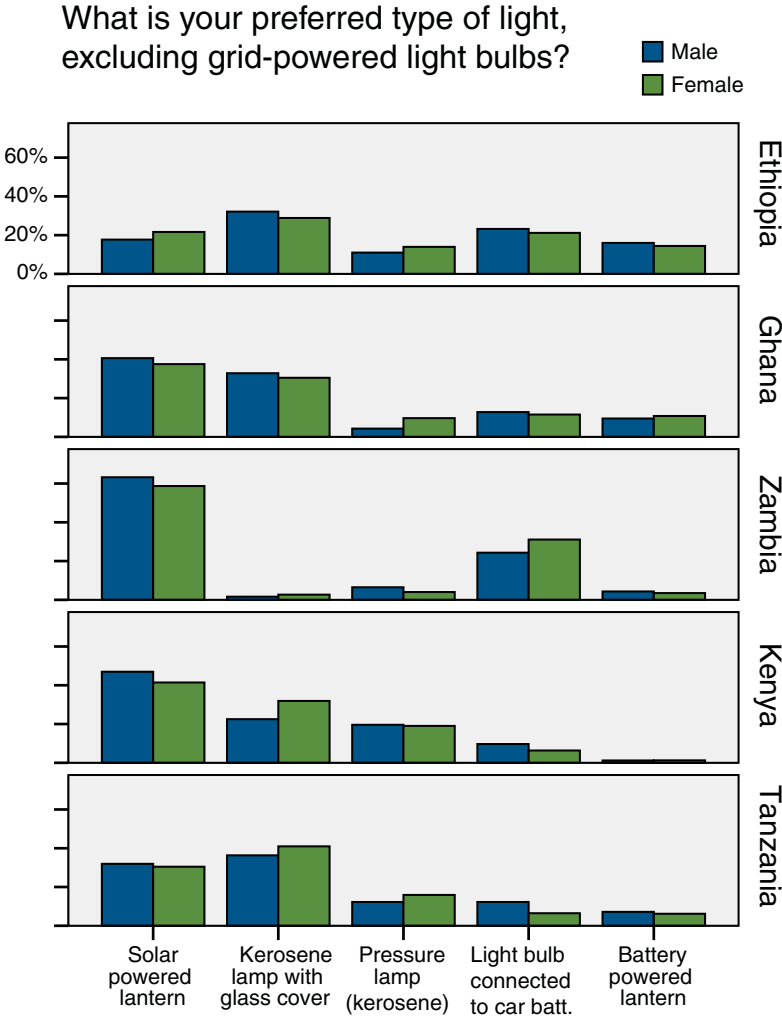


Figure 3: Lighting Preference for women and men (household respondents in market research dataset, n=5,000)

fin lamps whereas in Zambia women preferred light bulbs more often than men.

While the general differences in preference for household lighting do not cut across gender lines, there were distinct regional differences in the results. This highlights the need for approaches to modern lighting that recognize the geographic diversity of the market.

Moreover, women and men demonstrated slightly different preferences when it came to choosing from the variety of off-grid lighting products they were exposed to during the in-home trials. While both women and men preferred fixed, multi-point lighting systems, there was slightly greater preference among men for lights with a more portable design like that of a flashlight (Figure 4). The finding somewhat reinforces the notion that for men it is more of a priority that off-grid lighting be portable and facilitate activities outside the home at night. However, the relatively small sample size (n=100) prevents us from making any conclusions in that regard.



Both women and men desire higher performance lighting products.

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Out of the two products you tested in your home, which do you prefer?

■ Male
■ Female

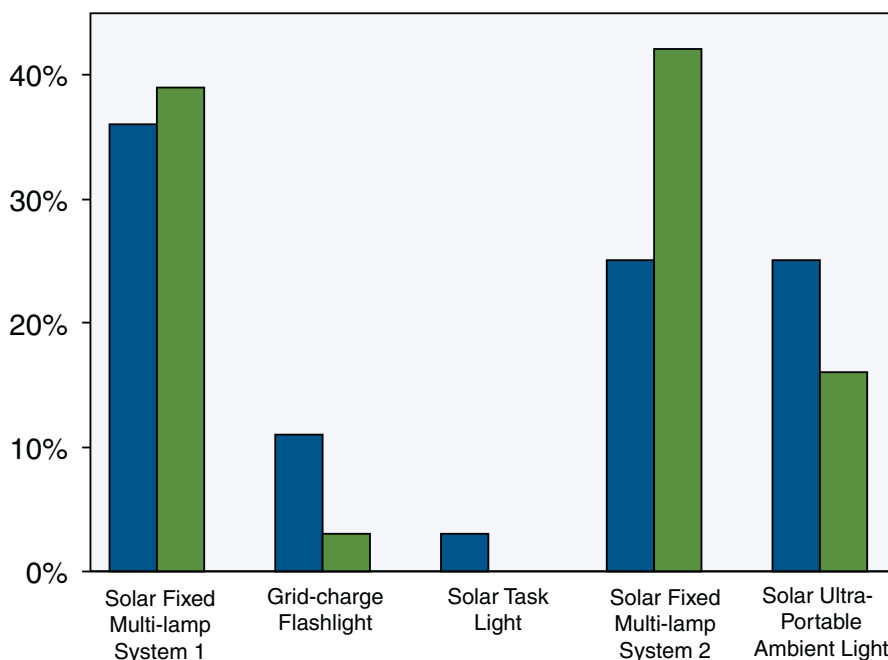


Figure 4: Modern lighting type preference for women and men after in-home trials (from market research, n=100)



© Peter Alstone

“I lack bright lights most because of what I have just explained earlier. I like teaching or helping my children with their homework at night because I do not have time for them during the day as I spend it at the market selling vegetable and kapenta. Even my son I talked about left because he could not manage to study using candles that we use to light our house at night.”

– Woman from Zambia who participated in the in-home trials (not pictured above)

Entrepreneurship: Women’s and men’s needs for lighting devices in a business context are driven by the nature of businesses that they operate, which often vary by gender.

Women’s entrepreneurship is more common in Africa than anywhere else, and according to the Africa Competitive Report, African women make up 50 percent of the self-employed and 25 percent of employers.^{xvii} Compared to men, their businesses tend to be smaller enterprises and are more often retail and service sector oriented. To a lesser extent, women also manage larger firms, and in those cases have been found to run them as proficiently as men

Entrepreneurs need lighting and other energy services offered by off-grid lighting for a variety of applications. Their needs and ability to pay can be driven by the particular business they operate and, to the extent

that women tend to enter unique enterprises, there may be opportunities for women-focused approaches to lighting for businesses.

The household surveys (Figure 5) showed that in each country, men were more likely to be farmers or laborers than women, and that women were more likely to operate small retail businesses than men. Women were also more likely to be unemployed. While off-grid lighting is important for most occupations, small retail businesses that can harness improved lighting to extend their working days to nighttime operation may yield greater benefits compared to more daytime-oriented work like farming and general labor.

Furthermore, Figure 6 shows that among the small businesses that were surveyed in the market research certain business types often lend themselves to gender specific management, such as salons and green grocers, which are often run by women, and barber shops and hardware stores, which are often run by men. For both men and women, nearly 80 percent of the businesses are micro enterprises with one or two workers. Also similar to men, nearly 40 percent of women owned enterprises are small permanent shops that have a single proprietor.

Mobile phones are an important aspect of women’s entrepreneurship, and highlight the value of off-grid lighting products that can also offer additional energy services, like charging features for phones and other small devices. A recent study entitled “Women & Mobile: A Global Opportunity” found that a woman is 23 percent less likely to own a phone than a man in Africa.^{xviii} At the same time, 41 percent of (globally) surveyed women report having increased income and professional opportunities once they own a phone, particularly women in rural areas or with low incomes. The benefits of modern lighting are multiplied when multifunctional lighting devices also empower women to access modern communication services more easily.

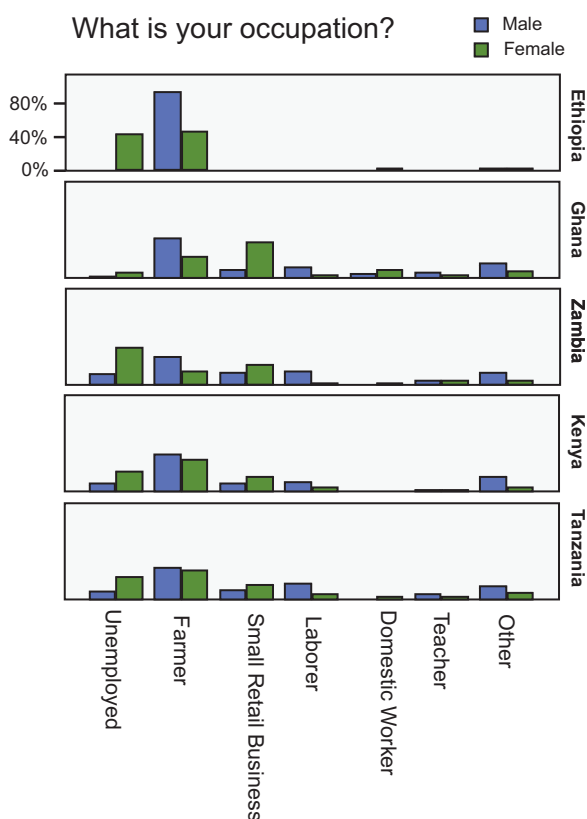


Figure 5: Occupations of participants in the household survey (n=5,000)

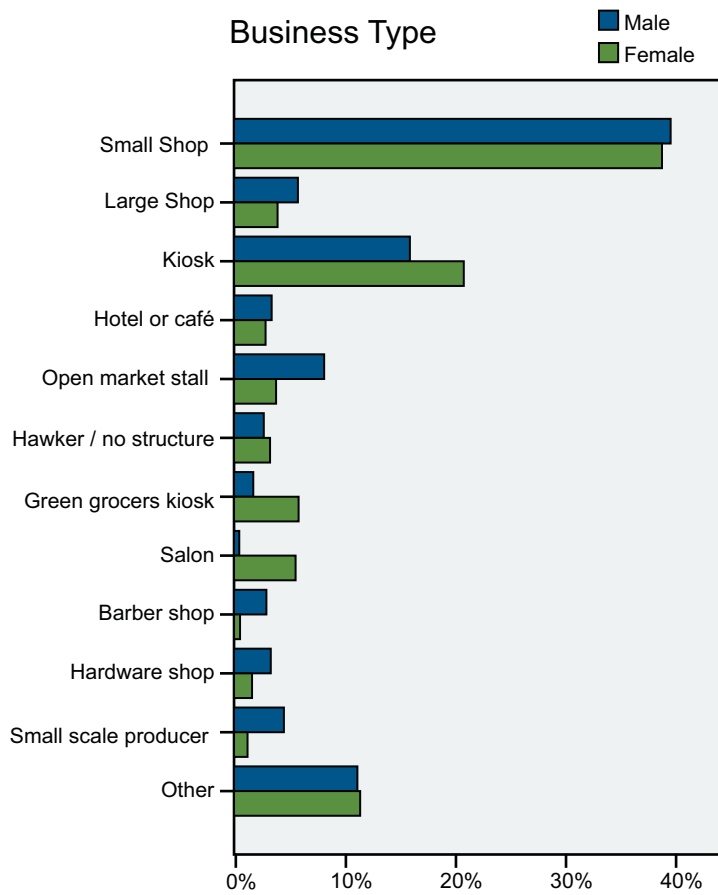
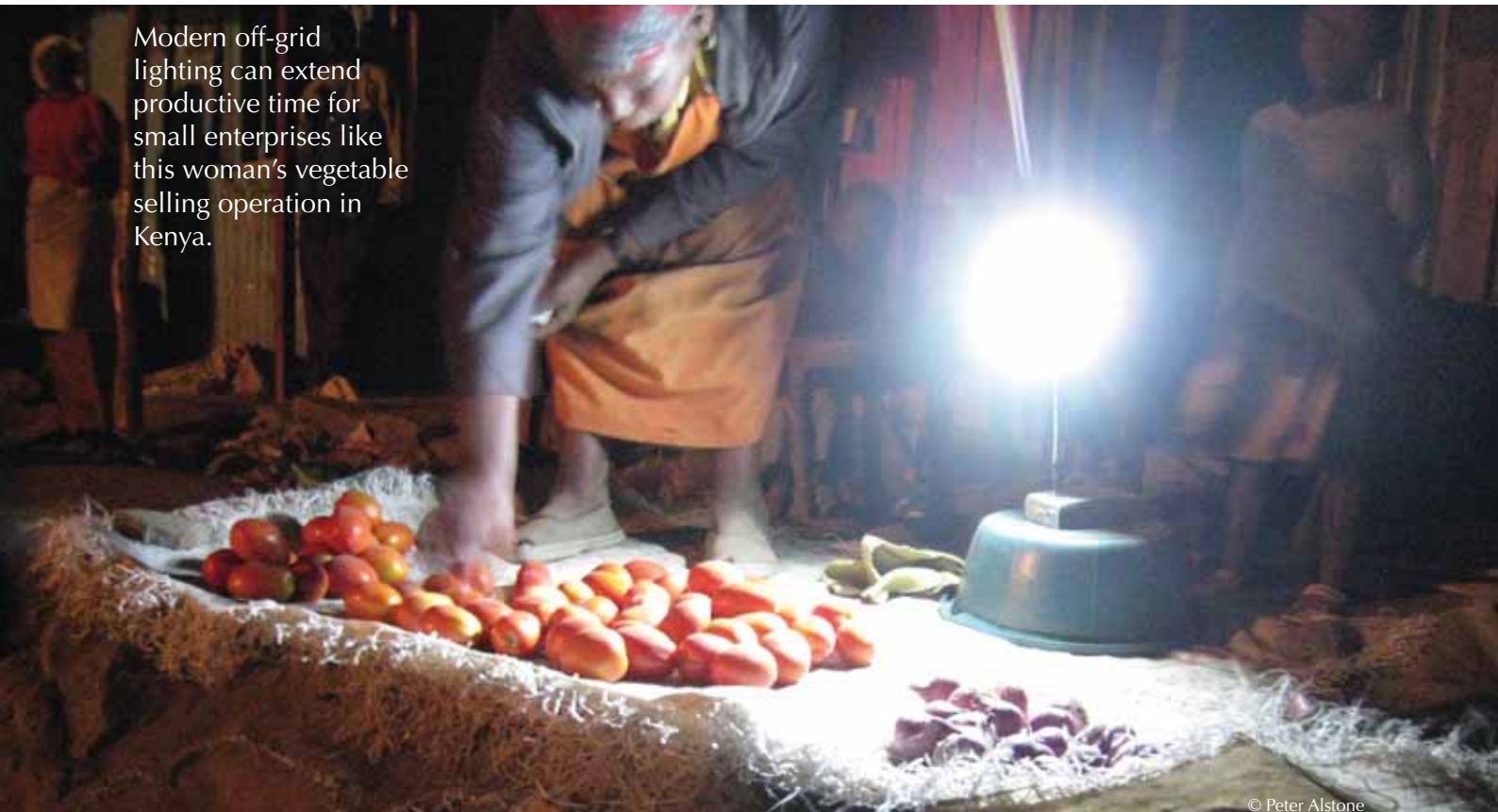


Figure 6: Types of businesses among those in the survey (n=2,500)

Modern off-grid lighting can extend productive time for small enterprises like this woman's vegetable selling operation in Kenya.



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Buyers: Women share responsibility for household decisions related to the purchase of lighting technology

For sellers and marketers of lighting products, it is important to reach out to women because of their decision making power within the household. Reaching the whole off-grid lighting market means reaching women as well as men.

Commonly it is observed that women are perceived to have lower status and that their preferences and welfare carry less weight than men in important household purchasing decisions. The African Women's Rights Observatory reports that women in most African countries have little decision making autonomy (10-20 percent) for large household purchases, and only slightly more (20-40 percent) for every day household purchases.^{xix} However, the Lighting Africa market research dataset suggests that women may have a greater role to play in the decision making process within a household for lighting-related purchases.

Representative off-grid lighting consumers were asked whether it was them or their spouse who decided when and which product to buy when shopping for new lighting devices. They were also asked who controlled the money for such purchases. Together, this information provided a good indication of the relation of gender to lighting purchases, and at various decision points in the purchasing process.

Over the five countries included in the market research survey, research results showed that

women choose when a new lighting device is to be purchased 38 percent of the time, whereas men make the decision 58 percent of the time, with some indeterminate responses (Figure 7). Similar trends—in general a 60/40 decision-making split between men and women—were observed regarding what kind of product to buy. Women had slightly less control over the money to make the purchases (31 percent) compared to their control over when and what to buy. Only two percent of households reported shared control over the money for lighting purchases.

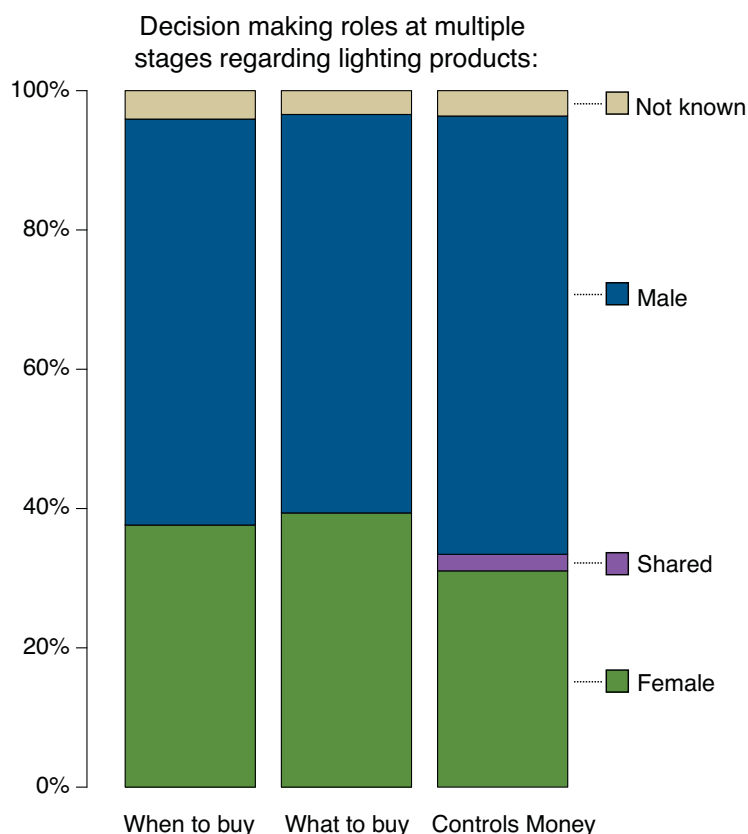


Figure 7: Decision making power for women and men in a household regarding lighting purchases (n=5,000)

Women’s power in the decision making process depends on geography, among other factors, as is depicted in Figure 8, which shows the “What to buy” responses in each of the five countries as an example. Ghana had the lowest level of involvement by women in deciding “what to buy,” only about 20 percent. Women have more of a say in Kenya, Zambia and Tanzania, with 40 to 50 percent of the respondents indicating that women have the power in the decision making process. The country-to-country trends for the other two indicators (when to buy and who controls the money) resulted in similar findings.

Among unmarried women, a much higher fraction than the population at large—almost 80 percent—act as the primary decision maker regarding type of lighting device to be purchased. Thus single women may have more of a role as decision makers than married women in poor households. Within the dataset this trend is true for all the countries surveyed except Ethiopia.

The findings that women have higher-than-expected decision making power for off-grid lighting purchases are confirmed, in a sense, by results from a 2008 survey of off-grid lighting product vendors in three towns

in Kenya.^{xx} In that survey, 57 percent of the vendors estimated that women and men were equally likely to be a customer for off-grid lighting products, while only 42 percent thought men were the more common customer.

The survey data are not perfect with regard to establishing who in the household is responsible for purchasing new lighting devices. Overall, most women and men indicate they personally are the decision makers, regardless of gender, and the results from this survey are self-reported predictions rather than “actual” results from surveying buyers of modern off-grid lighting products. In fact, fully 75% of the survey respondents indicated they personally were the decision makers. However, of the approximately 25% who indicated their spouse was the decision maker, there was a nearly even split in gender, indicating that neither men nor women tended to take undue credit for purchase decisions more often than the other. Given that result and the male-skewed nature of the sampling, it is of course possible that a higher fraction of women have decision-making power than is indicated in the survey results. In fact, the larger number of men in the sample combined with tendencies from both men and women to take credit for decisions

may have skewed the household decision results towards male power. Finally, the high up-front cost of modern off-grid lighting compared to fuel-based lighting may result in different household decision making dynamics altogether.

In spite of those caveats, the data still provide compelling evidence for empowered women. It appears that approximately 40 percent of the time women will decide when and what to buy; they are important players in the private sector market for off-grid lighting. The design of successful marketing and education campaigns will thus need to account for women’s stake by crafting messages what will be relevant and appealing to both genders.

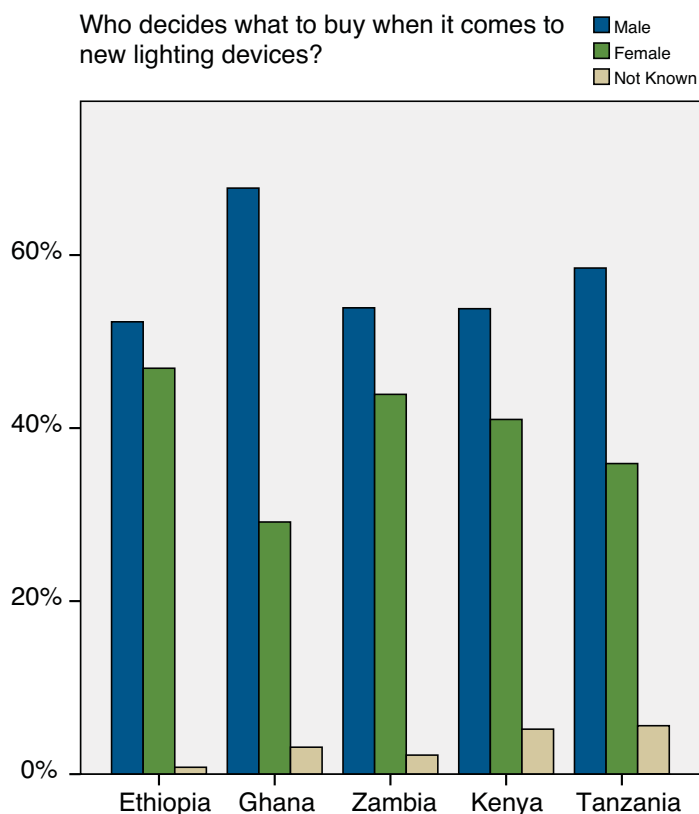


Figure 8: Who decides *when* to purchase a new light (n=5,000)



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“I do (choose the lighting device to be purchased) because most of the times, when you look at their father, he leaves this house at 4am and comes back at 10pm. He comes home tired so he cannot even bother with what we use for lighting.”

– Woman from Kenya who participated in the in-home trials (not pictured above)

“Sometimes it’s me (who chooses new lighting devices) and sometimes it’s my wife.”

–Man from Zambia who participated in the in-home trials (not pictured above)

Health Concerns: People with health concerns related to air quality have some preferences for cleaner lighting devices; there may be synergies between improved cook stoves and off-grid lighting.

Cooking and lighting are two primary sources of indoor air pollution in the developing world, and awareness of the health risks posed by fuel based lighting leads to greater demand for clean alternatives in many countries. This suggests health concerns could be used as a key message in marketing and education campaigns around off-grid lighting and more efficient cook stoves.

Everyone in the household benefits when modern lighting and cooking appliances replace inefficient alternatives, eliminating particulate pollution (“smoke”) from their environment, but women and children have the most to gain because they are disproportionately affected by the indoor air pollution from cooking and lighting relative to men, who are typically less involved in domestic life.

Overall, in four of the five countries surveyed, there is a general preference for solar lanterns among those who report being more concerned about smoke related health effects (Figure 9). The results are similar for both women and men who were surveyed. These results indicate that positioning a new clean and reliable technology as one that has some health benefits could improve the marketability of a product.

Given the ongoing efforts to eradicate chronic indoor air pollution with improved cookstoves, it is natural to incorporate opportunities to also eliminate the number two source of IAP, fuel based lighting, in those

programs and businesses. This work shows that those who have awareness of the real risks from IAP are more likely to choose clean alternatives.

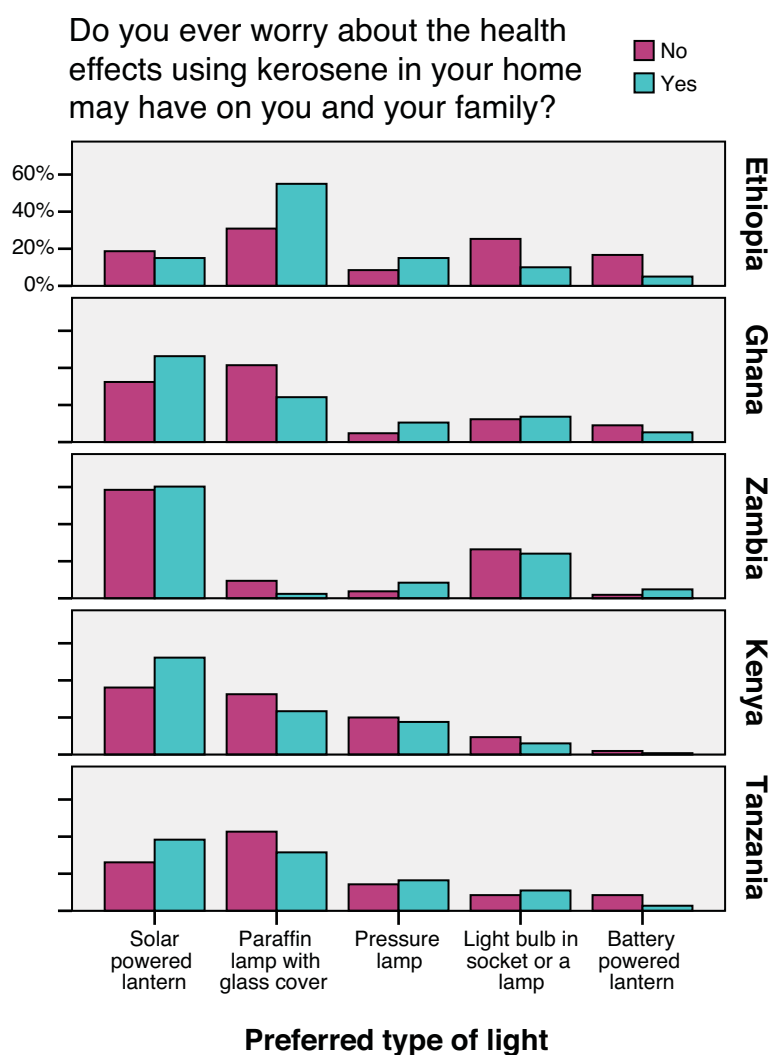


Figure 9: Lighting preference for survey respondents with and without smoke related health concerns.



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“As you can see my living style, it seems to be a living hell without good source of light, what I am currently using is something which not comfortable for health and good vision—especially for my daughter.”

-Woman from Ethiopia who participated in the in-home trials (not pictured above)

Financing: Without access to finance, there is no access to the benefits of modern off-grid lighting for many women and men.

Financing has proven to be one of the most important and difficult aspects of clean energy development, whether at the household or entrepreneurial level.

It is well recognized that the relatively high up-front costs are preventing price sensitive consumers acting on limited budgets from accessing modern lighting. Innovative financing could help unlock the market and allow women and men across Sub-Saharan Africa to break free from fuel-based lighting. At the household level, women have been known to be at the forefront of microfinance in other contexts, and could lead the way again with off-grid lighting. At the enterprise level, women have also been found to be reliable bank customers. Financial institutions can profitably expand services to women entrepreneurs when their programs respond to women’s needs.

Modern lighting consumes about 1/5 of average monthly profit at an average business (also about 1/5 of monthly income for the households). Considering that the upfront cost of even the least expensive modern lighting products (about \$20) is nearly 20 percent of the average household or business’s monthly

income, saving for the purchase requires a long commitment from cash poor consumers. For the poorest consumers, the challenges are even more daunting.

Figure 10 shows the number of days of income that the initial purchase cost of various LED lighting products represents for various segments of the market. The income data is based on self-reported monthly incomes for the 5,000 participants in the household survey across all five countries. The products with the highest level of consumer preference are also typically the most costly. Figure 4, which shows the preferences for various product types in the in-home surveys, indicates fixed multipoint products are often preferred, followed by portable lighting systems—these are often the most costly options (and also provide the most service). The low-quality flashlights that are sweeping through the market are included as a point of reference. Over 75 percent of the population can purchase one with less than one week of income. On the other hand, less than 50% of households can pay for a modern task light with one week of income. For the poorest 25 percent of the population, many alternatives are simply out of reach.

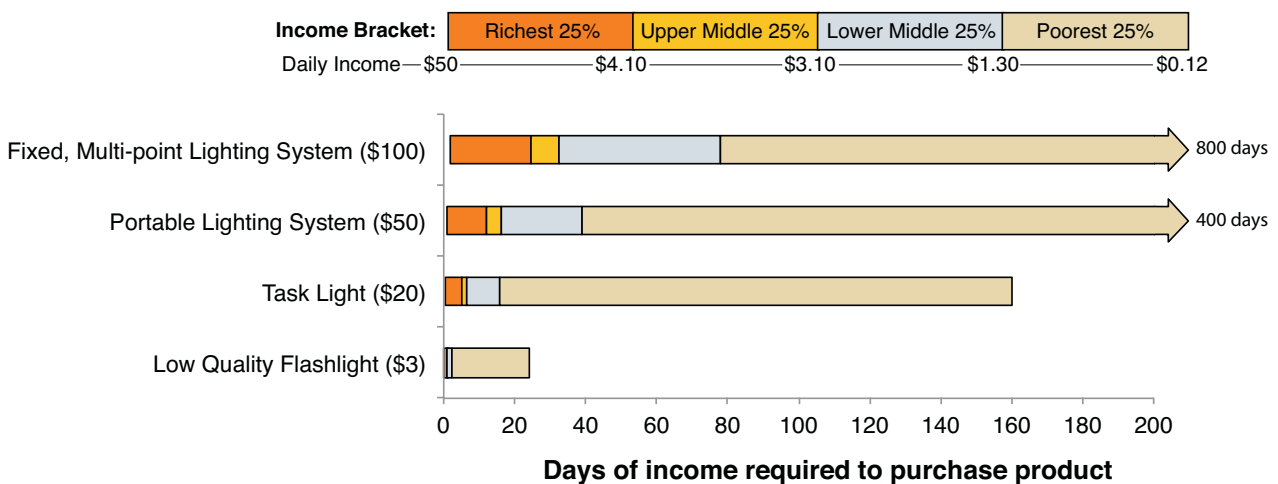


Figure 10: Days of income required to purchase various, hypothetical lighting products. The prices listed are representative of products that are available in the particular product categories.

Small Daily Purchases are the Status Quo

Women and men who rely on fuel-based lighting spend a large fraction of their current income on lighting, but in the form of small purchases, often daily, for fuel. In many cases the overall cost of modern lighting could be lower, but a large up-front payment prevents access. With targeted financing, the cost of modern lighting could be distributed across the first several months of use, more closely mirroring the status quo in terms of paying for lighting and women and men's availability of funds.

Another approach might involve targeted marketing in communities with cyclical income (for example, from seasonal farming harvests) with emphasis on the times of year when people have access to cash.



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(Above) A girl buys a plastic bag full of kerosene to take home to her family. It will be enough for a day or so.

(Left) A line forms at the kerosene shop near dusk—rush hour for the kerosene sellers—in Mai Mahiu, Kenya.

A recent World Bank study has shown that women have lower access to finance than men in many African countries and they tend to rely more on informal sources of capital and personal money management than men (Figure 11). In Kenya (2009), for example, the gender gap is 11 percentage points, with 32 percent of men using formal banking services but only 21 percent of women using the same. Women in Kenya (2006, 2009) and Tanzania (2006, 2009) are thus more likely to use informal services than men. In Malawi, Namibia, Rwanda, Tanzania, Uganda (2006) and Zambia (2005), women were found to be more likely to be excluded from any financial service (Ethiopia and Ghana were not part of the survey).

The Lighting Africa market survey confirms that people in the five countries have little access to traditional financing. Among the households that were surveyed, access to bank accounts was limited, with around 88 percent indicating they do not have any bank accounts. This trend did not vary with respect to gender. Among the small business owners, again very low numbers of respondents had access to a bank account; the highest rate of access was 25 percent, in Ghana.

Some challenges for financing are universal for poor men and women alike, such as a lack of credit history, illiteracy, inability to make large down payments, and low cash flow. However, women also have a particular set of additional hurdles preventing them from accessing consumer-level credit; Collateral requirements can be difficult to meet when property is often officially held by men; men are also the official wage earners in many households. Mobility is another challenge. Far away banks may be inaccessible to women who have responsibilities at home or when travelling poses security risk.^{xxii, xxiii}

Consumers aren't the only ones in the value chain who need access to finance. One way to increase the dispersal of energy efficient products is to support women-targeted distributor finance. It provides financing solutions that support the working capital needs of a seller's distributors and potentially distributors' resellers. The tenor of this financing is likely to vary depending on the off-grid lighting devices and

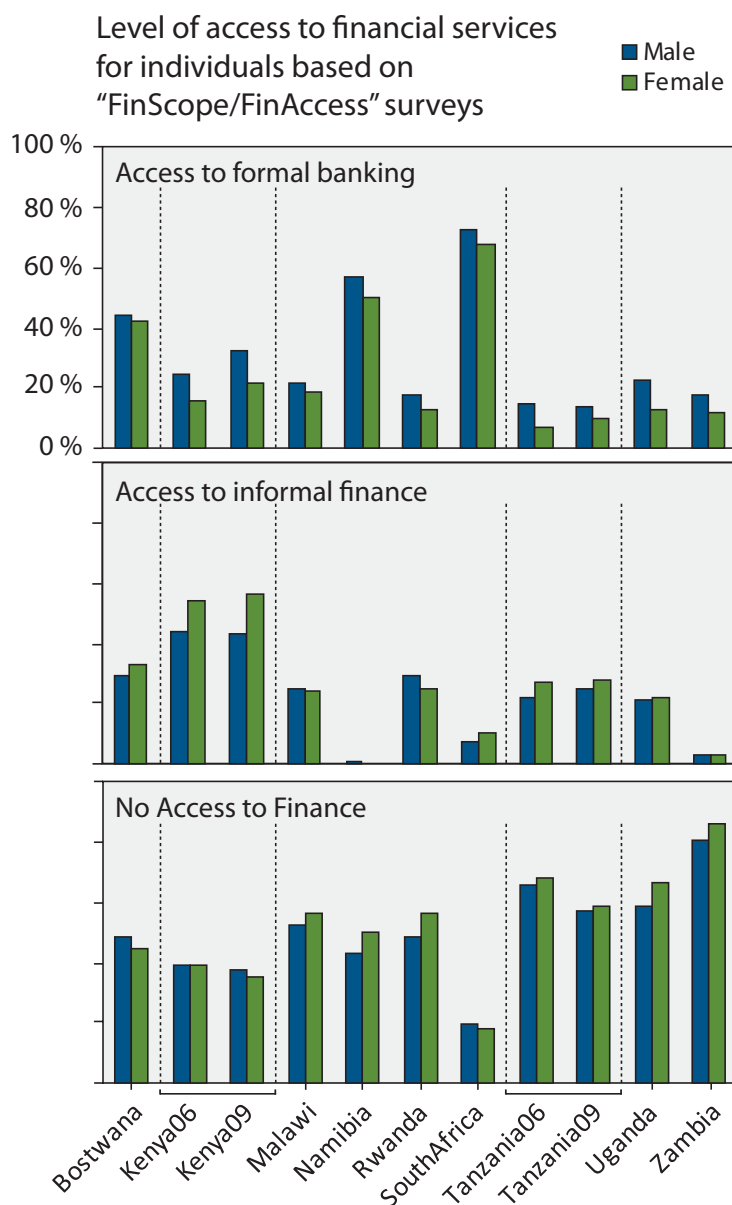


Figure 11: Access to formal and informal financial networks for women and men (adapted from Aterido et al. (2011)^{xxi})

market and could range from a few weeks to several months. Women distributors in particular may be able to benefit from this financing tool and should be included in any distributor finance marketing outreach. The potential benefits to the distributor are revenue growth, alternative financing, improved balance sheet management, and capacity building. Suppliers are able to offer qualified distributors improved terms and new financing.

Increasingly, there are financial institutions that focus on providing targeted financial services to women. For example, in 2007, Exim Bank became the first institution in Tanzania to cater to the vastly under-served

market of women business owners. Since then, Exim's profitable women-targeted program has exceeded expectations. Exim's Womens' Program Unit helped develop financial services products that better respond to the needs of businesswomen. In addition, as a way of building capacity for women entrepreneurs and making them more bankable, Exim Bank developed and ran basic financial literacy training for its current and potential women customers. Exim's partnership with the microleasing institution SELFINA further opened up opportunities for financing to female borrowers in 12 districts in Tanzania, including rural areas.

Another innovative financing approach to promote off-grid lighting is being applied by Solar Sisters in Rwanda, Sudan, and Uganda.^{xxiv} Rather than partnering up with a micro-finance institution to provide capital, Solar Sisters applies a "micro consignment" model partnering with formal and informal women organizations. The approach is favorable to potential women entrepreneurs who are reluctant and/or unable to take out loan and provide collateral for the energy-efficient devices. Instead, Solar Sisters—

without making a profit from interest rates—extends a loan themselves, providing women with the device inventory to sell to others. This lighting program also includes mobile phone technology. Participating women offer to charge the phones of others with their off-grid energy device for a fee, generating additional income for the entrepreneurial women. Mobile banking and text messaging are used to communicate with the entrepreneurs and streamline funds, making the program more efficient.

There are early indications that some modern lighting organizations are catching on. On a recent visit with a Lighting Africa distributor in Nairobi, he explained that his community outreach office is only staffed by women. They create links with formal and informal community groups that can help their members purchase improved lighting. Those groups are almost all run by women as well and serve the needs of women in communities across Kenya. Why focus on women-centered groups? Simply because "...they pay their loans."



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Relatively high up-front costs prevent some consumers from switching to modern off-grid lighting. Financing could help bridge the gap, but women often face additional difficulties in accessing financing.

The Way Forward

Women, just like men, are mainstream users, buyers, and beneficiaries of improved off-grid lighting. As demonstrated in this analysis, there is a substantial opportunity and need to reach out to women both as mainstream consumers of off-grid lighting products and services and as key entrepreneurs in the supply chain. There is a growing range of services beyond lighting—mobile phone charging, radios, and more—available from micro energy devices. The opportunities for reaching women with these energy services are large.

Meeting women's needs with modern off-grid lighting technology will require stakeholders across the value chain to take collaborative action.

For manufacturers and distributors:

- Evaluate your approach to selling to women; they are a significant part of the market and have decision-making power. A women targeted approach to marketing off grid lighting products involves different communication strategies since their socio-economic condition differs from that of men. Involving women in the supply chain, from distribution to retail, may help catalyze a successful approach.
- Partner with and support women's formal and informal networks to enable them to purchase your products. For instance, reach out to women's associations for group lending, marketing, demonstration effect, etc. In the past women's organizations have been successfully involved in marketing and administering renewable energy systems.
- Consider including messages about avoided smoke inhalation, an issue for women, men, and children alike, to drive demand.

For governments and development institutions:

- Find ways to support formal and informal financing frameworks to better reach women.
- Explore synergies between improved cook stoves (which are typically woman-centered) and modern off-grid lighting. There may be opportunities to co-market the two products in a way that leverages consumer-level (micro) finance for a multifunctional off-grid energy platform that provides clean cooking, lighting, and potentially other services as well, such as

Kenyan schoolgirls studying with a solar task lamp.



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mobile phone charging .

- Ensure that effective tracking of gender data is part of day-to-day operations, including market surveys, consumer outreach, and program monitoring and evaluation. There are key lessons-learned in this area included in the Annexes that follow.
- At the policy level, identify and address practical solutions to women's constraints to gain access to off-grid lighting, and in parallel access to the grid. Policies that include women in the development stage may help support women's access to electricity (grid and off-grid).

For financial institutions:

- Consider reaching the women's market through targeted products and services, a specific outreach strategy, and possibly financial and management skills courses.
- Partner with women groups that could assist with market outreach while at the same time leverage financial risk (for example, group lending, "micro consignment," etc.).
- At the SME level, promote women and men as distributors/resellers through distributor finance schemes.
- Explore mobile banking and the potential added value of linking mobile technology with off-grid lighting products.

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Annex 1: Surveying Women as Household Consumers and Business Owners: Topics and Questions for Market Research.

Women have a major role to play in the off grid lighting market both as consumers and business owners. They not only represent one half of the market but also play an active role in decision making within a household and business set-up. Hence is important to gather accurate information regarding the socio economic situation of women within a geographic market. One important drawback in using the Research International dataset for a women specific study was that it lacked a gender specific approach to the questions. Hence it was sometimes difficult to accurately access the required information from the dataset for this study. Drawing from the experience of this study and the sample questionnaires for the Research International survey, this section outlines important topics for researcher that want to better understand the women’s market¹ for off-grid lighting products.

Table 1: Topics for questionnaire when surveying women as consumers

Topic	Questionnaire Framework	Process
Socio-Economic situation	<p>Age, gender, education, employment, hours of work etc. should be recorded</p> <p>For households: Type of household (for example, single vs. extended family), number of family members, marital status, etc can help provide information regarding household income, purchases, and decision making.</p> <p>For businesses: Type of business, business-ownership and management should be recorded to help provide information regarding revenues, costs, and decision-making.</p> <p>Income of the respondent and other income sources within household or business will give important information on financial situation.</p> <p>Record the marital status of survey participants. This could explain access, preferences etc with respect to lighting (for example, married women and men</p>	<p>Identify single woman households clearly.</p> <p>Identify if the man or the woman of the household is the major income earner.</p> <p>To gather accurate information from the survey, direct the questionnaire to the head of the household or business.</p> <p>In some cases, it may be useful to interview women by themselves to help reduce influencing their answers by presence of men during the interview.</p>

¹ Women are not a homogeneous group and differ by income, education and social groups. Targeted research will help identify women’s roles in different markets and cultural settings.

	<p>may have preferences that are those of the entire family, rather than the individual's being surveyed).</p>	<p>Consider including women on interview team to facilitate access to women as interviewees.</p> <p>Assess whether certain interview times/locations are more suitable for women interviewees.</p>
<p>Access to electricity and other lighting services</p>	<p>Questions about electricity access should include time of use, intermittency, costs & billing, etc. This will help establish whether women and men have the same access and/or challenges.</p> <p>Do women and men have different preferences regarding energy demand (for example, continuous demand at a particular time? What are their main activities during that time interval?)</p> <p>What are the different needs of women in the context? Identify particular tasks affected by lack of access to a service.</p> <p>How would improved access to electricity/off-grid lighting improve living conditions (for example, increase in income, more efficient time-use)?</p>	
<p>Needs, Usage and Preference of products</p>	<p>How do women and men perceive and use currently available products?</p> <p>What products and/or services do women prefer in relation to their different needs/tasks?</p> <p>Do women and men equally decide on purchasing a new product or service? If not, who does?</p>	<p>Use of concept cards or pictures could give misleading information regarding preferences and pricing of lighting products. A better option would be to demonstrate a new product or provide product access to the survey participants (include both women and men) for use in</p>

		their premises.
Barriers and possible solutions to adoption new products and services	<p>What are the main barriers to adopting a new product or service?</p> <p>Do women face different challenges than men in overcoming these barriers? Do levels of education, mobility, access to financial services vary and play a role?</p> <p>How would women overcome these barriers? Are there any women specific solutions?</p>	
Willingness to pay for new services and products	<p>What is the expectation of a new product or service in relation to their end use (for example, would the product/service help increase income?)</p> <p>How much are women and men willing to pay by end use of the product? Any differences?</p> <p>Are women respondents willing to pay more/less for products that would warrant women-targeted marketing approach?</p>	<p>Ensure that both women and men respondents are aware of all features and have used the product themselves in a demonstration.</p> <p>It is important to collect accurate information about cost of current products in use and gender-differentiated willingness to pay for possible alternatives.</p>
Access to Finance	<p>What types of institutional and non-institutional financial services do women and men have access to? Are there differences in access/preferences?</p> <p>Do women or men of the household/business mainly partake in financial transactions? Both?</p> <p>Are women members of groups with whom financial institutions could partner?</p>	<p>Indicate the awareness level of the woman respondent with respect to the available sources of financial services.</p> <p>Questions on access to finance should include information about non-institutional sources of finance.</p>

<p>Access to Media</p>	<p>What is the extent of exposure to/demand of media sources like TV, radio and print media?</p> <p>Are there any gender differences regarding media preferences?</p> <p>How would women prefer being informed about new product offerings and services?</p> <p>What hinders women and men from gaining access (for example, lack of finance, time, education, mobility, etc.)?</p>	<p>Indicate the extent of daily use of TV, radio or news paper of respondents by gender, age, education and income levels.</p>
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ANNEX 2: Implementation, Monitoring and Evaluation

It is important to monitor and evaluate on-going off-grid lighting programs, not only to ensure their general efficiency and sustainability, but to promote their success in reaching population groups that might otherwise be excluded. This includes assessing whether the needs of women in general, and those of women in business in particular, are being met.

It is essential that lessons are learned from programs which have adopted explicit gender goals and/or specifically targeted women so that feedback may be used in follow-up programs. Such M&E activities should be based on sets of clear indicators and models which can adequately measure who is benefiting from off-grid lighting, in what way, and if not, why not.

1. Ensure Key Information Can be Gender Disaggregated

An assessment should be made of the extent to which basic information collected by market researchers, development practitioners, policy makers and so forth, can be analyzed by gender. Key data include customer satisfaction levels, and statistics on product use and costs. There will be complexities in gender disaggregation – for example, distinctions will need to be drawn between female-owned and female-managed businesses and between single women headed-households and households headed by both women and men.

2. Incorporate Output and Outcome Indicators that Highlight Gender Aspects of the Program

Indicator/Data Required	Gender Focus (gender disaggregation)	Source of Data
Output Indicators		
<ul style="list-style-type: none">Research	Quantitative indicators: number and/or percentage of women and men being surveyed to ensure representative survey sample and statistically relevant population of women and men.	Market Survey Data
<ul style="list-style-type: none">Marketing	Qualitative indicators: inclusion of portraits of women as users of renewable technology included in marketing materials	Marketing & Outreach Material
<ul style="list-style-type: none">Agency operations and accessibility	Qualitative indicators: opening hours of distributors' shops;	Market Survey Data Interviews with women

	<p>accessibility and safe locations of distribution centers</p> <p>Quantitative indicators: number and/or percentage of women managers and staff in the distribution center</p> <p>Number of women and men customers (baseline)</p>	focus groups
<ul style="list-style-type: none"> • Training and Outreach 	<p>Qualitative indicators: gender inclusive focus; gender issues articulated and addressed</p> <p>Quantitative indicators: Number and/or percentage of women and men participating/benefiting</p>	Distributors' Training Evaluations
Outcome Indicators		
<ul style="list-style-type: none"> • Uptake of renewable lighting sources 	<p>Quantitative: Incremental number of renewable lighting devices per household/business by gender Customer Referral to purchase off-grid lighting devices by gender</p> <p>Incremental number of hours of lighting per months in household/business by gender Average amount paid for lighting device by gender (to capture informal payments/bribes)</p>	Market Survey Follow-up
<ul style="list-style-type: none"> • Benefits 	<p>Quantitative: Incremental hours of business operations associated with adopted</p>	Development Impact Assessments

	<p>renewable lighting by gender</p> <p>Incremental household income associated with adopted renewable lighting by gender.</p> <p>Increased productivity (measured by reallocation of time spent) by gender</p>	
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