Improving Livelihoods in Morocco: Solar Lantern Field Evaluation

D-BRIEF *from MIT D-Lab Scale-Ups* **– Fall 2014**

RESEARCH OBJECTIVES

Verify and characterize the need of several population segments for alternative lighting solutions

Field test potential solar lantern solutions and gather user feedback

Recommend appropriate product(s) and distribution, sales, and marketing strategies for each segment

Identify and engage key stakeholders for the next phase of this project and additional research engagements

Solar lighting options for improved health, safety, productivity, and quality of life

In the summer of 2014, in partnership with the NGO *Targa-Aide* and the microfinance institution *Al Amana*, MIT D-Lab conducted an evaluation of solar lighting products for generally low-income rural households—both off-grid and on-grid—in Taounate, Morocco and ambulant merchants (mobile street vendors) in Kenitra, Morocco.

Although each of these populations has access to a variety of lighting solutions, high-quality, affordable solar powered lighting products may better meet their lighting needs, provide health and safety improvements, and yield cost savings over the lifetime of the product.

The study results provided information to help identify the most suitable solar lighting products for these populations and insights into the most effective and sustainable strategies for getting these products into their hands.

Ambulant merchant from Kenitra holding the Sun King Pro 2 solar lantern provided to her.

Key findings and recommendations

Rural Moroccan Households: Solar lanterns are a suitable product to meet the indoor lighting needs of off-grid households in rural Morocco (the primary target market) and the outdoor lighting needs of both off-grid and on-grid households in rural Morocco.

Product: Of the solar lanterns considered and evaluated, the Sun King Pro 2 is recommended as the most suitable product for rural households.

Distribution & Sales Channels: Recommended distribution strategies include a network of retail outlets, partnership with a microfinance institution, and a microfranchise network of vendors at *souks* (weekly markets).

Marketing & After-Sales Service: Effective marketing, customer engagement, and after-sales service strategies are critical components in a successful solar lantern business model.

Ambulant Merchants: Addressing the lighting needs of ambulant merchants should be pursued only in coordination with the Ministry of Industry's Directorate of Commerce and Distribution.

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Study methodology

One-hundred-two semi-structured interviews (30-60 minutes each) were conducted with rural households and ambulant merchants to gather information on preferences for existing lighting solutions and how they use them.

Study participants were provided with one of two solar lantern models and feedback was gathered from the participants after four to six weeks of product usage. One-third of the solar lanterns distributed to study participants were equipped with voltage and vibration sensors and a data logger to verify self-reported usage patterns.

Laboratory testing methods developed by the Comprehensive Initiative on Technology Evaluation (cite.mit.edu) were modified by D-Lab and used to evaluate the suitability of solar lanterns compared to existing solutions. Secondary research and key informant interviews contributed to the product, market, and business model analysis.

Market size and current practices

Despite an aggressive state-led rural electrification initiative in Morocco, between 191,000 and 275,000 households are not connected to the national electric grid (off-grid). Among the rural households that have a connection to the grid, there are unmet portable lighting needs. In addition, 300,000 ambulant merchants have needs for light to display their products.

For off-grid households, the most commonly used lighting sources are gas lamps (89%) and candles (63%) for indoor activities and flashlights (93%) for outdoor activities. All of the on-grid households use grid electricity as their primary indoor lighting source (using candles and gas lamps only during power cuts) and a mix of flashlights and lights powered by grid electricity for outdoor activities. For ambulant merchants, gas lamps are the most commonly used source of light (65%), followed by streetlights (42%) and grid electricity (26%).

Field assistant and translator Imane Khiyati (left) demonstrates the solar lantern to a Babuander resident in his off-grid home.

Product testing and user feedback

The data indicate that there is a market for solar lanterns across the rural household segments but less so for ambulant merchants. It was, also determined that the Sun King Pro 2 is the most suitable solar lantern for rural households.

Rural Households

All rural household segments (off-grid and on-grid) reported liking the quality of both solar lanterns tested. Study participants prefer the solar lanterns to their existing sources across many characteristics including brightness, light color, area covered, reliability, and durability compared to flashlights, gas lamps, and candles.

Further, study participants from rural households also like the capability of the lanterns to charge mobile phones and generally found the lanterns to be a good value. They indicated they would consider purchasing the product, and would recommend the solar lanterns to others.

Though the lighting needs of off-grid and on-grid rural households differ, both demonstrate significant interest in solar lanterns. On-grid households, which represent a larger market, have unmet lighting needs, particularly for outdoor activities and during power cuts. However, as many as one-million people in off-grid households across Morocco have more acute needs for access to improved lighting solutions to increase work productivty as well as to enhance their quality of life.

Ambulant Merchants

The results of the field evaluation indicate that solar lanterns could generate value for some ambulant merchants as a replacement for gas lamps. Fifty-five percent of these merchants reported completely replacing their gas lamps with the solar lanterns provided to them free of charge, while none of the ambulant merchants using grid electricity for lighting reported replacing their existing lighting sources.

Ambulant merchants currently using gas lamps are the most appropriate target market for solar lighting products. Although they generally reported the solar lanterns were good products overall, many of them also indicated that compared to their gas lamps, the solar lanterns were less bright and covered a smaller area. This indicates that multiple solar lanterns or small solar home systems might be required to meet their needs.

Distribution, sales, marketing and after-sales service

Rural households

Three primary sales and distribution strategies have been identified as suitable for reaching the rural population in Morocco:

1. Sell solar lanterns through a dealer network of existing retail outlets such as filling stations, supermarkets, hardware stores, and electronics stores.
2. Utilize partnerships with microfinance institutions to sell solar lanterns in rural communities.
3. Develop a micro-franchisee network to sell solar lanterns at *souks* (weekly markets) in rural communities.

A direct-to-customer network of sales agents is a common strategy utilized by several manufacturers and distributors in other regions. However, there are significant upfront costs for this approach, and it is more suitable for markets with a higher population density where each sales agent has access to a large number of customers within a defined geographic area.

In contrast, the three distribution strategies recommended utilize existing sales networks and therefore have lower costs of implementation. Multiple distribution and marketing approaches could be implemented in the same region to achieve increased market penetration.

The primary challenge for marketing and selling solar lanterns is communicating the long-term value proposition of the unfamiliar solar lantern technology. The Sun King Pro 2 solar lantern is a high-quality product with a two-year warranty and an expected lifetime of five years. While this product has a higher upfront cost than the existing solutions in Morocco, there are no reoccurring costs for maintenance or fuel.

Young boy from Ennoukla village showing the Sun King Pro 2 solar lantern given to his grandmother.

For example, if an off-grid rural household is currently spending 72 Moroccan dirhams (8 USD) per month on their existing lighting solutions (such as gas lamps, candles, and battery powered flashlights), and if the solar lantern can reduce these costs by half, the solar lantern will pay for itself in less than ten months, providing a savings of over 1,800 dirhams over the five-year lifetime of the product.

To ensure long-term satisfaction with the solar lanterns, effective marketing, customer engagement, and after-sales support are critical.

Ambulant merchants

The solar lanterns could also generate value for some ambulant merchants as replacements for gas lamps. Because the Ministry of Industry's Directorate of Commerce and Distribution has plans to formalize the ambulant merchant sector in the near future, it is recommended that addressing the lighting needs of ambulant merchants should be done only in coordination with the Ministry.

In the absence of a coordinated street-lighting plan, a combination of solar lantern and solar home-system products could be marketed and distributed to ambulant merchants through either a dealer network approach or partnership with a micro-finance institution.

Business model comparison for solar lighting sector in Morocco.

Model	Distribution	Marketing	Financing Options	After Sales Service	Operation Cost	Market Penetration
Dealer networks	Existing retail stores	Needs to be coordinated	Not available	Retail store locations	Low	Low
Direct to customer	Network of sales agents	Sales agents in the community	Mobile financing	Sales agents	High	High
Franchise	Network of franchises	Needs to be coordinated	Rent to own	Franchises	Moderate	Moderate
Institutional partnership	Agents with partner inst.	Existing relationships	Partnership with MFI	Agents with partner inst.	Moderate	Moderate

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FIELD RESEARCH

Researchers from MIT D-Lab spent almost two months in Morocco for this study. They taught residents of Taounate, Morroco and ambulent merchants in to use solar lanterns and after using the lanterns on their own for four to six weekd, the researchers returned to evaluate the appropriateness and usefulness of the lanterns to their work and lives.

Pictured at left: a woman from Lamchha village watches D-Lab Scale-Ups research associate Megha Hegde demonstrating a d.light solar lantern.

Next steps

The next step is a market test to validate the efficacy and sustainability of the recommended business models for distribution and marketing of solar lanterns.

Implementation of the market test will include engaging relevant stakeholders for each of the potential sales, distribution, and marketing strategies. Prior to the implementation of the market test, distributors will receive training on product operation and effective marketing and sales techniques. Monitoring and evaluation that will take place during the evaluation will track the progress of each distribution and marketing channel.

Upon completion of the market test, business models that prove successful will be continued. Oversight would be shifted from D-Lab staff to relevant stakeholders during a carefully staged transition period to ensure continuity and strong project coordination.

Further information & full report

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Future impact

Improving Livelihoods in Morocco: Solar Light Field Evaluation is one of a series of studies intended to enable microfinance institutions to increase access to technologies and products that will improve the lives and livelihoods of people living in poverty in the Middle East and North Africa (MENA) region.

While the results from this study and the upcoming market test are specific to the context and market in Morocco, many of the findings and insights about the evaluation process can be applied to future evaluations of other technologies in other geographic locations within the MENA region.

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Launched in 2011 by D-Lab, the Scale-Ups program assists social entrepreneurs from MIT and the developing world, as well as NGOs and corporations, to bring poverty alleviating technologies to market at scale.

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Image on page one header: Children from an off-grid household in Qantara village smile while trying out the d.light solar lantern.