

First Place

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African Solar Rise: Electrifying Rural Tanzania

Introduction

In September 2012, Daniel Uphaus—a young German entrepreneur and founder of the nongovernmental organization African Solar Rise (ASR)—was in his office in Dar es Salaam, Tanzania, reading this passage from *The Economist*:¹

Which plastic gadget, fitting neatly in one hand, can most quickly improve the lives of the world's poorest people? For the past decade the answer has been clear: the mobile phone. But over the next decade it will be the solar-powered lamp, made up of a few light-emitting diodes (LEDs), a solar panel, and a small rechargeable battery, encased in a durable plastic shell. Just as the spread of mobile phones in poor countries has transformed lives and boosted economic activity, solar lighting is poised to improve incomes, educational attainment, and health across the developing world.

As the head of an organization distributing solar products, Uphaus had personally observed the potential benefits of such technology for the local population in Tanzania. He thought about Micah Rukenya, a Maasai schoolteacher from Langaⁱ whom he had recently met. An amicable fellow and a typical young man living in rural Tanzania, Rukenya trusted Uphaus enough to share his problems. "One night my daughter was sick, you know. She is very naughty, you know, she laughs all the time. But she was sick. Very sick." Unbeknown to Rukenya, his daughter had inhaled fumes from the kerosene lamp they used to light their home—a common practice in rural Tanzanian families.



Rukenya desperately needed to call a doctor but his mobile phone, an old Nokia, was completely uncharged. Charging the mobile phone involved a litany of challenges. It is extremely difficult for Langa's people—just as it was for some 85% of the country's population—to obtain electricity (see **Figure 1** for an overview of electrification levels in Tanzania).² Charging his phone required that Rukenya undertake an arduous journey

ⁱ A small village near Simanjoro, one of the five districts of the Manyara region in northeast Tanzania.

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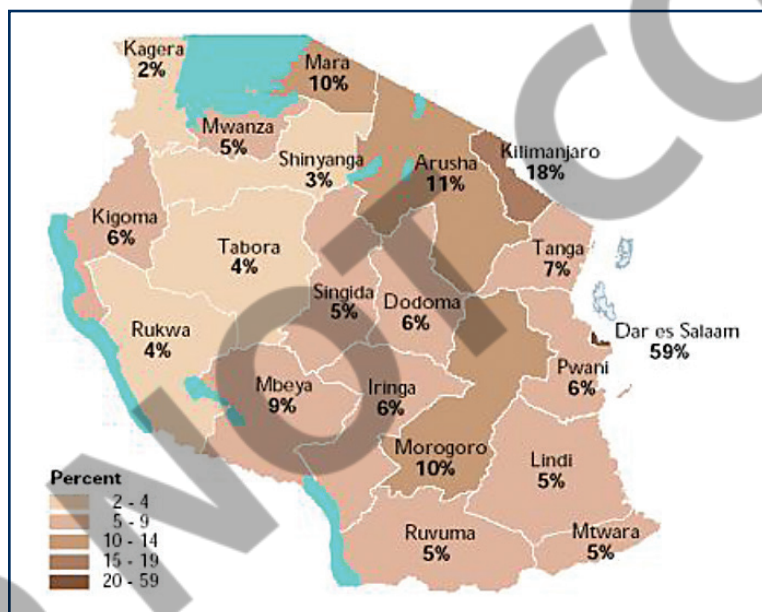
© 2014 Andrea Masini and Sam Aflaki. This case was written by Andrea Masini (associate professor of operations management and information technology at HEC Paris) and Sam Aflaki (assistant professor of operations management and information technology at HEC Paris) in collaboration with a team of HEC Paris MBA students: Anamaya Bajpai, Fouad Khalife, Veronica Lin, Yamini Naik, Taras Ostapchuk, Alexandros Papapetropoulos, and Samuel Rocha. The authors are grateful to QNRF for providing financial support to the project through NPRP grant 5-873-5-133.

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to Simanjiro, about 25 kilometers south of Langai. Because of poor roads, it would take him about two hours to reach Simanjiro by bicycle (three hours during the rainy season). Thus, Rukenya would have to spend nine hours (including the charging time) to accomplish the simple task of charging his phone, all while his daughter was sick at home.

Uphaus knew that Rukenya's situation was shared by an estimated 39 million Tanzanians with no access to electricity. The solution was simple, he thought. If Rukenya had one of ASR's products—a solar-powered lamp with mobile phone-charging option—then he could have spent that night with his family and his healthy, laughing daughter. For unlike kerosene lamps, solar-powered lamps do not emit hazardous chemicals; and, of course, he could make an emergency call if needed without delay.

Figure 1
Electrification Levels in Tanzania



Source: Tanzania Rural Energy Agency.

Recent technological advancement in the solar industry made its products more simply designed, robust, and durable. Reduced prices of main components (LED lights, batteries, solar panels) and improvements in performance increased the attractiveness of such solutions to the extent that it made not only environmental but also economic sense to replace kerosene lamps with solar power. Yet despite these improvements, the market penetration of solar products remained surprisingly low in Africa. Uphaus had to wonder: Why, given the benefits of solar products, was their diffusion so limited?

To fulfill its mission, ASR would have to increase sales significantly. Hence identifying and eliminating bottlenecks that hindered diffusion of solar products in Tanzania became a high priority for Uphaus. However, he was being forced to spend time also on another complex dilemma: financing ASR operations in ways that relied less on unpredictable donations. Uphaus was well aware that solving these problems was necessary if the young nongovernmental organization (NGO) was to survive. Uphaus knew that if ASR were to suspend its activities for even one or two months, all its recent progress would be for naught. Given fluctuating sales and with only enough cash to survive for another six months, Uphaus was in urgent need of solutions. Unfortunately, the problem did not look simple. If only he could get some help . . .

Company History & Background

African Solar Rise

While studying in Arusha, Tanzania, in the summer of 2008, Daniel Uphaus frequently encountered interference from repeated power outages. Although the university was paying \$500 each day for generators, it was unable to provide continuous power. Thus Uphaus was experiencing the same problem encountered by many people at the “bottom of the pyramid” (BoP).ⁱⁱ Vexed by this hindrance to his studying, Uphaus resolved to find a solution. An obvious approach seemed to be the use of solar energy (a resource widely available in Tanzania)—not only to solve his company’s problems but also to improve the lives of the local people. Determined to turn his ideas into reality, he attended business plan seminars in 2009 and 2010. This dedication led to winning the prestigious German Business Foundation Competition, which awarded him €15,000 to start a new venture. The only caveat was that Uphaus first had to attend marketing, finance, and other business courses. Once equipped with the necessary academic background, in 2011 he founded the start-up firm African Solar Rise (ASR).

African Solar Rise was a nonprofit organization -with a mission of bringing renewable energy solutions to developing African communities (in particular, Tanzania) and empowering locals to set up sustainable businesses. From its offices in the capital city, Dar es Salaam, the ASR team supported Tanzanians in rural areas to start businesses using renewable energies and also accompanied them in the early stages of business development (see **Figure 2** for the ASR organization chart as of July 2013). African Solar Rise also distributed picowave solar photovoltaic home systems with a mobile phone–charging option. The systems could supply power for radios, fans, and other low-voltage devices. A solar product typically includes a 5Ah 12V battery connected via several cables to a polycrystalline solar panel, some lamps, and a mobile charger. The packaged product cost \$20 to \$110. When fully charged, an individual system supplied power for 7–28 hours depending on how many lights were being used; most systems lasted four to five years (see **Figure 3** for a typical solar home system).

The Challenges of Rural Electrification in Africa

Uphaus knew that accelerating the diffusion of solar systems would require that he systematically examine customer adoption decisions. Also since he still had to resolve ASR’s financing dilemma, Daniel definitely needed help from someone with business experience. Hiring professional consultants was not an option for any cash-constrained NGO. In a stroke of luck, Daniel discovered that a group of MBA students from a preeminent international business school were seeking internships in a developing country.

Figure 2
Organization Chart of African Solar Rise, July 2013



Source: African Solar Rise.

ⁱⁱ In economics, the *bottom of the pyramid* is the largest but poorest socioeconomic group. In global terms, the BoP consists of about 4 billion people who live on less than \$2.50 (US) per day.

Figure 3
Typical Solar Home System (Barefoot PowerPack, 5W)



Source: www.barefootpower.com.

In response to this opportunity, Daniel quickly contacted candidates eager to apply their talents to serving an important cause. He formed two consulting teams: the first was to identify bottlenecks in the sales process and to examine customer behavior; the second team's mandate was to identify viable solutions to ASR's financing problem.

The consultants gathered in April 2013 at ASR offices in Dar es Salaam for their first meeting with Daniel Uphaus, Maxim Leer (head of strategy and fundraising), and Moriba Schwarz (country manager). Uphaus welcomed his guests and reminded them of ASR's challenges: "We need to understand why people do not buy as many solar products as we would expect, and we want to find a solution to finance ASR operations." The teams quickly set off to work on their respective problems, traveling the whole country to interview potential customers and to meet with stakeholders and potential partners (see **Figure 4** for an overview of the areas visited by the two consulting teams).

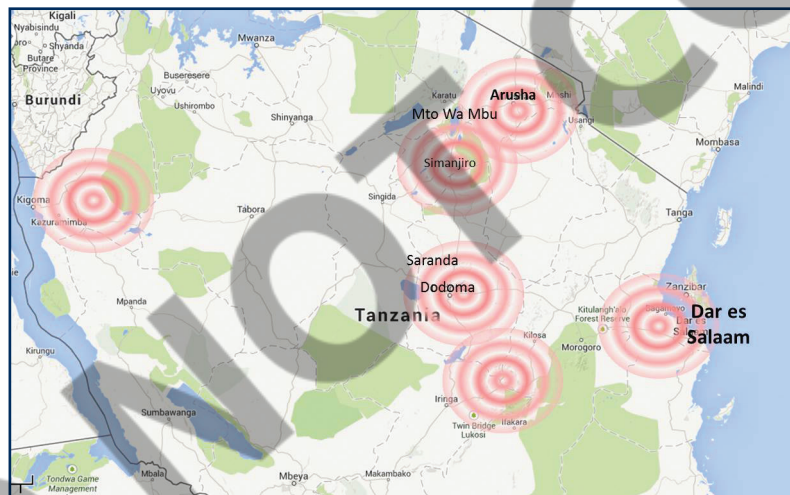
After several weeks of travel and hard work, the consultants met again with Uphaus, Leer, and Schwarz to summarize their findings and discuss recommendations. The presentation began with this statement:

We found overwhelming evidence that two main bottlenecks hinder the diffusion of solar products in Tanzania: (1) ineffective supply chain operations that suffer from lack of infrastructure and a poor understanding of customer behavior; and (2) poverty of the customer base and scarcity of proper financial solutions.

In addition, both teams agreed that the problem of financing customers was strongly intertwined with the problem of financing ASR's own operations.

Uphaus, Leer, and Schwarz—who had always believed that poverty was the main barrier for the diffusion of solar products—were intrigued. They invited the student consultants to continue their presentation and expound upon their points.

Figure 4
Areas Visited by African Solar Rise, April–July 2013



Source: ASR internal data.

Supply Chain Issues

Infrastructure Problems and Market Fragmentation

Markets in Tanzania, which is located in sub-Saharan Africa, posed substantial supply chain and operational challenges to the diffusion of consumer products. A few days in the field confirmed the importance of tackling the “last mile” distribution problem—in this case, delivering the products to remote locations, where people needed them the most.ⁱⁱⁱ In Tanzania, millions still lived beyond the last mile.³ Without access to markets and resources, these mostly rural consumers were forced either to pay higher prices for goods or to accept low-quality alternatives. Few companies were willing to cover the costs of traveling on bad or non-existent roads to deliver goods to sparse populations, so these people usually remain unserved. Thus, inadequate infrastructure contributed no less (if not more) to uncertain product supply than did the local population’s limited purchasing power.

ⁱⁱⁱ The *last mile* concept was created by the telecommunications industry to describe the outermost reaches of their networks. It has since been generalized to represent all remote communities that are barely covered by health care, electricity, or other infrastructure networks. The marginal cost of connecting the last mile is higher than any other part of a network, and it is typically in the last mile that service quality is most diminished.

Though supplemented by rail, transport in Tanzania in 2013 was mainly via a road network of limited quality. Most roads were unpaved: Tanzania had 86,472 kilometers (53,731 miles) of roads, of which only 7,092 kilometers (4,407 miles) were tarmacked.⁴ There were few paved links from the capital to the southeastern, western, central, or northern regions. Most roads between these areas were dirt tracks, with a few improved gravel sections. Dirt roads become impassable during the rainy season and could remain in that state for days or (more often) weeks, even in large cities such as Dar es Salaam (see **Figure 5**). As a result, distances were usually counted in hours, not kilometers. Access to rural areas was extremely time-consuming; a 190-kilometer trip from Arusha, a large city in northern Tanzania, to Simanjiro, in the heart of the Maasai land, took five to six hours under normal conditions—assuming you had a reliable 4 x 4 vehicle (see **Table 1** for more examples). Most of the local population used old Indian or Chinese motorbikes (called “piki-pikis” or “boda-bodas”) that were neither well maintained nor reliable.

Figure 5
Road Conditions in Kawe District, Dar es Salaam, During the Rainy Season



Source: Consultant team photo.

Table 1
Examples of Travel Distances and Time, July 2013

From	To	Distance	Time	Road Surface
Dar es Salaam	Arusha	650 km	10–12 hours	90% tarmac
Dar es Salaam	Simanjiro	500 km	14–16 hours	75% tarmac
Dar es Salaam	Dodoma	450 km	6–7 hours	100% tarmac
Simanjiro	Arusha	190 km	5–6 hours	100% gravel
Dar es Salaam	Kigoma	1250 km	2 days	75% tarmac
Simanjiro	Landanai	60 km	2 hours	100% gravel
Dar es Salaam	Nyanzwa	450 km	7–9 hours	75% tarmac

Source: Distance data from Google maps. Travel time and road conditions from consultant team’s field trips.

In 2013, Tanzania’s fragmented retail landscape was a reflection of the continent’s geographic and population characteristics. Africa was home to more than an eighth of the world’s population distributed over nearly a fifth of the earth’s land surface. In Tanzania as in much of the continent, large parts of the country were sparsely populated and the most common arrangement was villages and huts. This low population density naturally shaped

the retail landscape. Like most consumers in Tanzania, Micah Rukenya bought goods from traditional grocery shops (small stores and family shops; see **Figure 6**), from retailers, and from unregistered sellers (e.g., street vendors). Modern retail was growing, but it remained a small fraction of the country's retail landscape. Moreover, the ASR team observed that trading habits differed from region to region. In some Maasai tribal villages, for instance, the population still traded via the barter system (exchanging cows or chickens for goods).

Figure 6
A Typical Family Store



Source: Consultant team photo.

Customer Behavior and Marketing Challenges

The student consultants noted that—compared with other organizations operating in different regions of the world—supply chain operations were more challenging for ASR because it had to account for the behavior and preferences of local customers. The ASR consultants were frequently surprised by the feedback they received about product specifications (as when a customer complained: “I don’t like white cables, because they get dirty very fast in this dusty environment”). Consumer behavior worldwide was not that well understood, and there had been no comprehensive research on consumer needs or behavior in East Africa. Hence products were often ill-adapted to local conditions, which led to low rates of product adoption. The Tanzanian customer perceived value in ways that might differ from what the manufacturer assumed. For example, size evidently mattered when it came to solar products. A high-performance yet compact lithium-ion battery was considered to be less valuable than a relatively inefficient but bigger and heavier lead-acid battery. Furthermore, since complexity was easily mistaken for technical sophistication, products with lots of switches and cables could be preferred to simpler and more user-friendly systems. Such preferences posed a paradox for product design, since nearly all of Tanzania’s rural population required training even for such simple tasks as connecting two cables and removing dust from solar panel surfaces. This problem was aggravated by the lack of instruction manuals printed in Swahili.

Another identified influence on solar product penetration was customers’ temporal preferences. The results of the consultant team’s research revealed that Tanzanian consumers had relatively high discount

rates and were myopic in their decision-making. Their planning horizon was short, and their purchasing behavior was spontaneous and strongly affected by emotional criteria. As a result, few consumers valued a product's long-term benefits. In this country, the attitude of customers toward future uncertainty was well captured by the proverb "a bird in the hand is worth two in the bush."

Finally, the consultants discovered that trust figured largely in customer behavior. Often expressed as *mawli kawli* (good honor), trust was a key criterion that affected customer behavior on a daily basis. Each community had its own opinion leaders (say, a priest or a schoolteacher) who were highly respected and to whom people turned to for advice. Trust figured prominently in regards to a product's country of origin. Brand awareness per se was not a concern; what mattered is where the product was made. When it came to solar products, often the first question was: "Was this made in China?" Since Chinese manufacturers flooded the market with low-quality products, solar products acquired a negative image in an environment where word of mouth was the most effective marketing tool.

Top-down Versus Bottom-up Approaches to Distribution

It did not take long for Uphaus to agree that optimizing the distribution channel's structure was necessary to accelerate the diffusion of solar products. Yet it would be far from easy to build a value-driven and quantifiable distribution strategy that reflected the behavior and preferences of Tanzanian customers.

African Solar Rise envisioned distribution as a three-level hub system with the following components: (1) a central warehouse located in Dar es Salaam, Tanzania's largest city and the country's most important economic center; (2) a few regional warehouses located in strategic geographical sites within range of rural networks; and (3) a network of mini-hubs located in rural areas. The central warehouse would serve all the regional warehouses, which would then redistribute the supplies to partners via mini-hubs in rural villages. The mini-hubs were thus the main channels for reaching customers in the remotest locations. Mini-hub personnel would play critical roles: they are responsible for taking orders from customers (the so-called end users), placing these orders with the regional warehouses, and maintaining a minimum inventory level. They would also deliver products to end users by way of kiosks, door-to-door sales, or customized *piki-pikis* (see **Figure 7**). Furthermore, because the mini-hub personnel would deal directly with end users, they must receive technical training on all products and be able to install those products as well as to handle after-sales service.

The ASR team believed that the scheme just described would prove to be the most efficient at addressing Tanzania's challenging logistics landscape. But how might this scheme be implemented? Two clear alternatives each came with advantages and disadvantages.

The first alternative was to partner with one or more organizations that had already established a distribution network. Examples of strong networks in urban and rural Tanzania included beverage companies (e.g., Coca-Cola) and telecommunications companies (e.g., Vodacom). The distribution strategy of such companies incorporated the whole spectrum of sales channels ranging from the modern urban "shop in shops" to traditional rural grocery stores (often painted in the company's colors) to kiosks and street sellers (see **Figure 8**). At the regional level there were a number of nongovernmental organizations—for instance, schools and churches—with a strong and reliable network. These NGOs were often asked to distribute consumer products or medicines in rural areas.

Figure 7
Transporting Goods on a Converted Piki-Piki



Source: Consultant team photos.

Figure 8
Three Vodacom Distribution Channels



Source: Prumoz. "Battle of the Mobile Phone Giants." <http://prumoz.wordpress.com>

The second alternative was to build a distribution network from scratch by setting up individual sales points in rural areas through youth groups, farmers, Maasai guards, and the like whose members were interested in becoming micro-retailers. African Solar Rise would provide training in sales and marketing to these village entrepreneurs and would accompany them through the first steps of their new professional lives. Each one of these solar entrepreneurs would sell 30–50 products per month, mostly on a door-to-door basis and while relying strongly on their own networks of family and friends (see **Figure 9**).

Figure 9
Door-to-Door Sales



Source: Consultant team photo.

It was clear that each option had both strengths and weaknesses. Uphaus' task was to determine which alternative was best for ASR—that is, which was most likely to sustain its benefits to all parties concerned, including those in the most remote areas. Also, notwithstanding the two options' relative merits, Uphaus knew that his decision should not be made without first assessing its effect on ASR's financing problems. It was therefore time to hear from the second student team.

The Financing Dilemma

Background

African Solar Rise could continue to operate only if it found a stable source of financing. At the time, the organization was too reliant on uncertain donations from various sponsors and foundations. The most logical option would be to ensure that its solar distribution operation was profitable enough to cover the cost of products sold plus all overhead costs. Yet how would that be possible when costs were nearly impossible to predict? Andreas Bergmann (ASR's CFO) helped make the point: "Every month new contingent costs arise—either when importing the products into the country, transporting them to the rural areas, providing warranty, or other activities issues. During some months ASR earns a profit, while during others, particularly when shipments of new products are delayed and it runs out of inventory, it loses money" (see **Table 2** for ASR's profit and loss statement). Uphaus emphasized that the mission of ASR, as an NGO, was to deliver solar energy in the most affordable way (in particular, not necessarily in the most profitable way). Even so, ASR had little cash left and urgently needed to find a stable source of financing.

Table 2
ASR's Profit and Loss Statement, April–September 2013

In Tanzanian Shillings	Year Total	Apr	May	Jun	Jul	Aug	Sep
Revenue Total	38,384,000	960,000	2,924,000	13,433,000	15,549,000	4,228,000	1,220,000
Products	36,384,000	0	2,924,000	12,673,000	15,549,000	4,228,000	940,000
Other	2,000,000	960,000	0	760,000	0	0	280,000
Cost of Products Sold	22,766,811	0	1,813,654	7,565,262	9,733,901	2,886,818	719,071
Gross Profit	15,617,189	960,000	1,110,346	5,867,738	5,815,099	1,341,182	500,929
DOE	21,657,710	1,461,700	5,887,000	4,283,600	5,234,110	3,663,200	1,128,100
Solar Sales Shops	9,224,500	65,000	3,542,000	2,461,000	1,284,000	1,070,000	802,500
Solar wells	0	0	0	0	0	0	0
Solar village	2,279,600	9,500	840,000	0	857,000	573,100	0
Mansion	4,369,310	770,500	1,200,000	835,000	378,110	1,135,700	50,000
Administration	3,586,100	123,000	125,000	163,600	2,460,000	479,500	235,000
Miscellaneous	983,800	234,700	30,000	203,500	255,000	220,000	40,600
Other	1,029,500	259,000	150,000	620,500	0	0	0
Transaction	184,900	0	0	0	0	184,900	0
EBIT	-6,040,521	-501,700	-4,776,654	1,584,138	580,989	-2,322,018	-627,171

Source: ASR internal data.

The consultants argued that the problem of financing ASR operations was strongly intertwined with that of financing its customers and business partners. In order for ASR to generate a stable revenue flow from sales, products had to be both available and affordable. The development of a network of solar entrepreneurs to distribute products in remote villages was a promising initiative to tackle the product availability issue; however, it did not solve the affordability problem. Neither the target customers nor the fledgling entrepreneurs had more than a few dollars per day to spend, and therein lay the core of the problem. Customers could not afford the product, and entrepreneurs had no start-up capital to buy an initial batch of solar-powered systems.

Uphaus interrupted to say: “You are suggesting that unless ASR first solves the problem of financing customers and solar entrepreneurs, all our efforts to improve distribution would be useless.” The consultants nodded. So Uphaus then asked, “How can ASR help its customers find the resources to buy solar products or help entrepreneurs with no start-up capital to pay the full cost of the products upfront?”

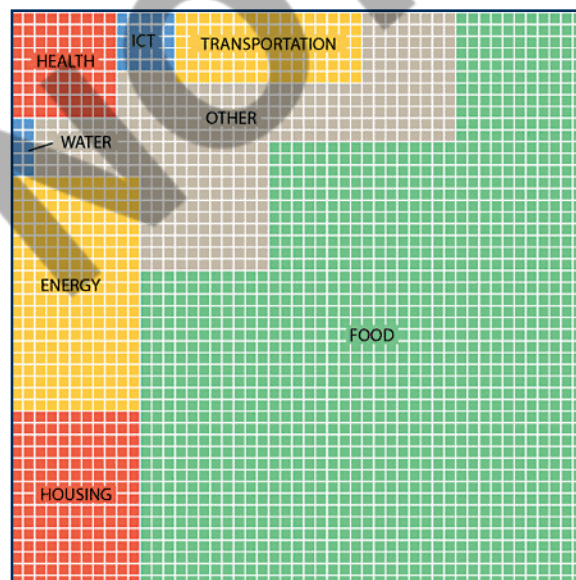
Financing Customers

The consultants noted that the cost of solar energy was low enough to compete with kerosene lamps in the long run.^{iv} However, field interviews clearly indicated that hardly any potential customers considered solar-powered systems to be economically viable. Purchasing a solar system was usually out of the question because potential customers were short of cash and lacked access to financial services. Although related, the two problems had different causes.

Cash Shortage

Most rural Tanzanians were unable to answer the question “what is your monthly income?” Few had a stable income that could be expressed in monetary terms. The Tanzanian economy relied mostly on agriculture, which accounted for almost half of gross domestic product and employed about 80% of the workforce.^v The majority of this rural population fell into the BoP customer segment and spent approximately 70% of household income on food, housing, and energy (see **Figure 10**).⁶

Figure 10
BoP Consumption by Sector



Source: World Resource Institute.

Making matters worse, rural dwellers paid the “poverty premium”: prices for most goods (including solar products) were much higher in remote villages than in cities. This disparity stemmed from higher distribution costs and a greater number of intermediaries. For example, in Landanai (**Figure 11**), a remote village in the Manyara region where Maasai tribes lived, residents paid twice as much for the same clothes

^{iv} The price for a high-quality solar product with a lifespan of four to eight years ranged from \$30 to \$135. In comparison, a typical Tanzanian family used about 2 liters of kerosene each week. With kerosene priced at 2,500 TZS/liter (i.e., about \$1.54/liter at the time of this writing), solar products were extremely cost-competitive.

as residents of Arusha, the largest city in northern Tanzania.⁷ In a country where the average annual income was just above \$500,⁸ the proportionately high up-front costs characteristic of solar products (some \$30–\$100 for a solar home system) discouraged their purchase—especially by the populations most in need—regardless of the potential long-run savings.

Figure 11
Simanjiro and Landanai, Main Villages of the Manyara Region (Masaai Land)



Source: Consultant team photos.

An additional barrier arose from the seasonality of peoples' income. Because most Tanzanians depended on agriculture, their incomes and consumption were highly seasonal. For example, in Nyanzwa—an off-grid village in the Iringa region—people were strongly inclined to buy solar products immediately after the annual onion harvest. Yet in the two weeks before that harvest, ASR entrepreneurs were able to sell only three products in a village of 8,000 people. Rural people seldom have much cash on hand, and it usually takes time to acquire funds by selling livestock or even agricultural products.

Access to Financial Services

Income fluctuations would cause fewer problems if rural dwellers had the benefit of banking services. However, no more than a fifth of the sub-Saharan population used a bank in 2010.⁹ Without access to finance, there were few opportunities to generate income or to improve living and economic conditions.

The student consultant team had conducted several interviews with local bank managers and customers to shed some light on these problems. Access to bank loans was compromised by three factors. First, most Tanzanians did not have a bank account, and offering financial services to poor people was simply unprofitable for mainstream banks. Second, there was a severe shortage of acceptable collateral, and so lending money involved significant risk. Third, the usual credit-scoring and collections systems could not be used; for this population, the bank's costs of screening and monitoring were too high for lending to be profitable.

Under these conditions, microfinance institutions (MFIs) were the first option for poor households seeking a loan. The pioneers of microfinance in Tanzania were NGOs, that began to emerge in the mid-1990s.¹⁰ Savings and Credit Societies (SACCOS) were another type of microfinance services provider active in Tanzania, and banks had also joined the industry over the last decade.¹¹ However, MFIs were concentrated in areas with both easy access to markets and high-density populations; they had not yet devised an approach to reach the neediest rural masses.

Mobile banking could contribute to historically unbanked regions finally gaining financial access, and it underscored the importance—especially in rural areas—of being able to charge a mobile phone. Mobile

telephony was a powerful technical platform for the banking industry, one that was capable of delivering low-cost financial services to people in rural areas without bank offices. In sub-Saharan Africa, where traditional banking had been hampered by transportation and other infrastructure problems, mobile banking had expanded to constitute fully 16% of the banking market.¹² The use of such “mobile money” was growing even faster in Tanzania, where monthly transactions increased from 1.9 million per month in 2010 to 48 million per month in September 2012.¹³

Financing Solar Entrepreneurs

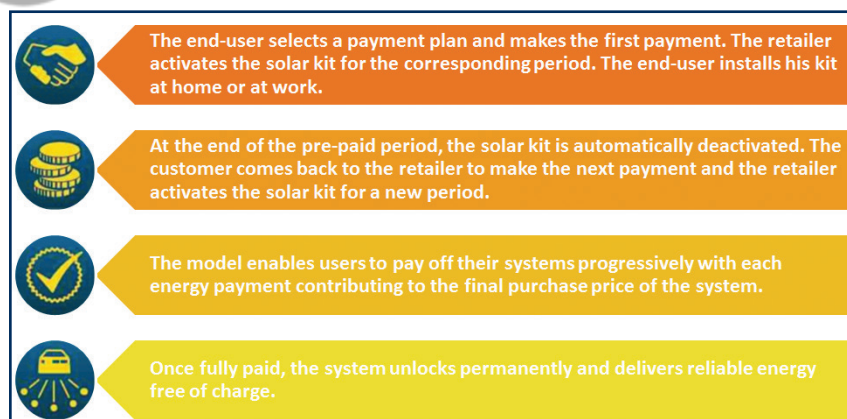
The second consulting team was familiar with the solar entrepreneur option, but they had some reservations. “The challenge of working with entrepreneurs is that they almost always lack the start-up capital to begin a reselling business. Each new entrepreneur needs to invest around \$4,000 in 40–50 products to be able to earn enough profit to reinvest . . . after selling them and covering salary, transportation, and fuel costs. This is a lot of money in Tanzania even for established shop owners.” African Solar Rise realized that giving products to new entrepreneurs on credit would tie up working capital and expose the organization to the risk of theft. Thus an innovative financing model was needed.

Once again, Uphaus stepped in. “I was initially intrigued by your colleagues’ proposal to work with local entrepreneurs. It seemed quite logical. Now, however, I am more skeptical. I do not really see how we could make it work if we do not address these financing issues.” He continued, showing little optimism: “Your analysis is comprehensive. However, it identifies problems rather than proposing solutions.” It was thus time for the second team to offer recommendations.

From Buying to Leasing: Pay-as-you-go Option and Crowd Funding

As a way of overcoming the local population’s inability to pay the full cost of solar products up-front, the MBA consultants proposed that ASR adopt a “pay as you go” (PAYGO) plan. With this plan, a microchip embedded in the solar energy system’s central unit enables the retailer to activate and deactivate the device according to a customized payment plan selected by the end user. The innovation lies in allowing the system to work on a prepaid basis for a specified amount of time. When the prepaid period expires, the system stops working until the user makes another payment, at which time the retailer reactivates the system for another period. This procedure provides a simple “rent to own” alternative and allows users to pay for the device gradually via a customizable payment plan (Figure 12 gives an overview of the PAYGO concept).

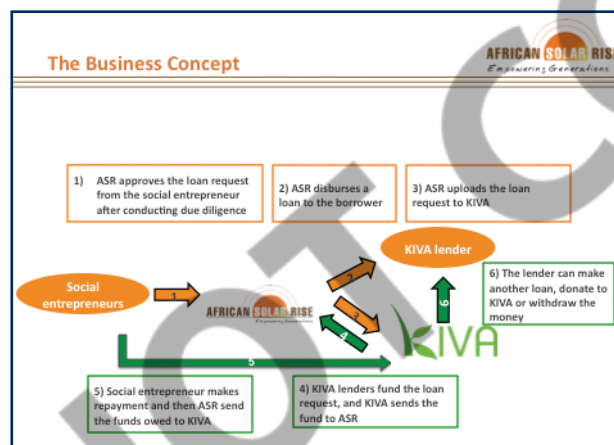
Figure 12
Overview of the Pay-As-You-Go Plan



Source: Adapted by the authors from ASR material.

The consultants also suggested that ASR consider partnering with a platform that promoted crowd funding, an extremely promising option to fund entrepreneurs in developing countries. For instance, Kiva.org allowed people from around the world to lend money to high-potential entrepreneurs unable to access a traditional bank loan (see **Figure 13** for an overview of how Kiva works).¹⁴ The consultants had already engaged in some preliminary talks with Kiva, which was prepared to sign an agreement. Once an entrepreneur survived ASR's own due-diligence process, a public profile would be created on Kiva's website, telling the entrepreneur's story to all interested investors (see **Figure 14**). Individuals worldwide would loan the needed funds; the entrepreneur would use these funds to buy inventory from ASR, which in turn would pay back Kiva. Thus ASR would serve not only as facilitator between entrepreneur and Kiva but also as guarantor that Kiva would get its money back.

Figure 13
Process Overview of Kiva.org



Source: Prepared by the authors.

Going Forward

On his way home after the meeting, Daniel Uphaus pondered the challenges his organization faced. The consulting teams had done well in presenting all the information needed to evaluate his options, but now the decision was for him to make. He acknowledged that his multi-faceted operational and financing problems could not be solved without implementing innovative business models in collaboration with suppliers, entrepreneurs, partners, and—most importantly—customers. With just enough cash to survive for six more months, ASR urgently needed to make two key decisions.

1. First, although Uphaus was certain that improving last-mile distribution was necessary to foster the diffusion of solar products, he had not yet decided how to improve that process.
 - a. Would it be better for ASR to adopt a top-down approach and partner with organizations that had already established a distribution network?
 - b. Or should ASR adopt a bottom-up approach, developing its own distribution network by leveraging the efforts of locals who want to become solar entrepreneurs?
2. Second, Uphaus had to decide how best to handle both ASR's and its customers' financing problems.
 - a. Was the PAYGO system the ultimate solution to ASR's financing problems and the key to unlocking Tanzania's solar market?

- b. Although this system was attractive in theory, its implementation remained unclear. How and where should repayments be made? Would the attitude of “a bird in the hand is worth two in the bush” affect the success of this approach?
- c. Finally, Uphaus was about to sign an agreement with Kiva and lend out \$24,000 to fund solar entrepreneurs. Should ASR close the deal and develop the ASR–Kiva partnership?

Figure 14
ASR Entrepreneur’s Website Submitted to Kiva.org

Welcome sevl.sp@hotmail.com! (African Solar Rise) [Logout](#) | [Help Center](#) | [Visit Kiva](#)

Name, Loan ID, Client ID or Kiva ID [FIND A LOAN](#)

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Borrower Profile: Micah Phillipo [Print for Staff](#) [Print for Borrower](#)

Client Level Information

Kiva ID	578577
Loan ID	2 (Edit)
Client ID	Mic (Edit)
Name	Micah Phillipo
Location	Simanjiro

Loan Level Information

Loan Amount	\$4,200.00
Loan Amount with Kiva Roundup	\$4,200.00
Loan Amount (USD)	\$4,200.00
Loan Term	14 months
Currency	USD
Conversion Rate	1
Loan Representative	
Posted By	Severin Spring
Last Due Date to MFI	29-Aug-2014
Primary Sector	Retail
Primary Activity	Renewable Energy Products
Loan Themes	Startup
Status	paying back
Delinquent?	No

[View this loan on www.kiva.org](#)

History

Date Disbursed	06-Jul-2013 00:00:00
Date Posted	28-Jun-2013 09:35:29
Date Fundraising Began	01-Jul-2013 13:10:11
Date Raised	02-Jul-2013 18:16:50
Date Paying Back Period Began	06-Jul-2013 00:30:44
Invoiced Amount	\$0.00
Cumulative Principal Repaid (Reported)	\$0.00
Outstanding Balance (Reported)	\$4,200.00

Loan Description

Loan Use to buy solar products for resale

Description (en) Micah is a 26-year-old Maasai from Tanzania. His hometown is situated in Simanjiro, South of Mount Kilimanjaro. Like many men of his tribe, he moved to the big city Dar es Salaam to try his luck as a security guard. For his job he earns about 100 USD per month. Despite this bad income, there was something good about the job: during the time he got in contact with many English speaking people and that's why he is (apart from Maasai language and Swahili) also fluent in English. However, "a real Maasai doesn't belong to big cities like this," Micah says, and it is clear that he wants to go back to Simanjiro, even though he has some concerns about home. One of these big concerns in Micah's home village is lack of electricity; people need to light up their houses with kerosene lamps, which are very unhealthy and also really expensive. Therefore, Micah wants to start his own social business and bring affordable solar energy to his family members and friends. African Solar Rise helped him to write a business plan and provided him with technical training as well as sales training. With a loan we do not only empower Micah to start his own social business; we also reach all of his family members (and Maasai normally have big families!) and provide them with renewable, clean, and sustainable energy. Because of his good reputation as a guard and our personal experiences with him during our training sessions, where he showed some admirable entrepreneurial capabilities, we are confident that the loan will be fully repaid after a little more than one year.

Source: www.kiva.org (accessed 30 Sep. 2013).

Endnotes

- ¹ *The Economist*, 1 Sep. 2012. <http://www.economist.com/node/21560983>.
- ² Tanzania Rural Energy Agency report.
- ³ The “Project Last Mile in Tanzania.” Yale Global Leadership Institute.
- ⁴ “Tanzania.” *The World Factbook*, United States Central Intelligence Agency.
- ⁵ “Tanzania.”
- ⁶ Hammond, Allen, William J Kramer, Julia Tran, Rob Katz, and Courtland Walker. “The Next 4 Billion: Market Size and Business Strategy at the Base of the Pyramid.” March 2007. <http://www.wri.org/publication/next-4-billion>.
- ⁷ Based on the consultant team’s own experience.
- ⁸ “Tanzania.”
- ⁹ “Financial Access Survey.” International Monetary Fund.
- ¹⁰ Tanzania Association of Microfinance Institutes (TAMFI).
- ¹¹ “Tanzania.”
- ¹² Gaddis, Isis, Waly Wane and Jacques Morisset. “A bank in your pocket: The mobile money revolution in Tanzania”. March 19, 2013. <https://blogs.worldbank.org/african/a-bank-in-your-pocket-the-mobile-money-revolution-in-tanzania>.
- ¹³ Gaddis et al, 2013.
- ¹⁴ www.Kiva.org.



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