

INTEGRATING SOLAR PRODUCTS INTO THE RURAL BIOGAS DISTRIBUTION NETWORK

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Country: Rwanda

Sector: Renewable Energy

CHALLENGE

In Rwanda, more than 90% of the population is cooking with biomass and despite being one of the most densely populated countries in Sub-Saharan Africa, only 4% of rural households use electricity as the main source of lighting (EICV3), hindering their ability to carry out basic activities at night or in the early morning, including household chores, conducting business, reading and completing schoolwork. The Rwanda Economic Development and Poverty Reduction Strategy (Economic Development and Poverty Reduction Strategy- EDPRS 2/ 2013-2018) states that rural connected households in Rwanda consume below 30kWh/Year/Capita (0.45 kWh/day/Household, equivalent to 60 W if considering 8 hours utilisation/day), well below urban consumption and ten times less than Sub-Saharan African average of 478 kWh /Year/Capita. The typical rural household requires energy for charging cell phones (Mobile penetration rate in Rwanda is 63.7%), radio and lighting, which could be suited to solar and micro-grid (**Off-grid solutions**), considering that in general the range of products offered by suppliers to typical rural households are ranging from 5W to 300 W. Again, off-grid solutions could be more economical than on-grid solutions, considering that Rwanda's electricity is relatively costly at USD 0.24 kWh, compared to Kenya's USD 0.15/kWh, Uganda's USD 0.17/kWh and Tanzania's USD 0.05/kWh.

Major constraints that hinder off-grid product penetration, solar included, are:

1. Limited energy budgeting at household level and lack of awareness on renewable energy products (Including benefits) and services especially in rural areas
2. Unavailability of (good quality) products, after sales services and relative high cost of purchase/installation
3. Inefficient distribution channels with limited/non-established retailing systems particularly in rural areas (Last mile retailing system)
4. Lack of investors (foreign and local) with a long term vision and able to invest in distribution channel development; currently their businesses are focusing on relatively 'easy' urban markets
5. Insufficient economies of scale resulting in relatively high indirect costs (promotion, overheads, etc.) being incurred by entrepreneurs
6. Difficulty for foreign investors to find financially and technically capable local partners/investors
7. Absence of harmonised quality monitoring systems, product guarantee offers for the beneficiaries and overall regulation
8. Lack of management, entrepreneurship and business skills of (potential) entrepreneurs in rural areas
9. Insufficient access to finance for end users and entrepreneurs

It's within the above context, that we have tested the integration of solar products and opportunity for subsequent rapid dissemination within the already operational and efficient rural biogas distribution channels, for which a number of the above mentioned structural deficiencies have already been overcome.

CLIENT

The Rwanda Energy Group/ The energy Development Corporation Limited is responsible for the management and implementation of renewable energy programs including Biogas, solar and improved cooking stoves. The national domestic biogas program (NDBP), a project implemented by the government of Rwanda through the Ministry of Infrastructure and the Rwanda Energy Group/The energy Development corporation Limited and technically supported by SNV has been developing a market-oriented domestic biogas sector. Currently more than 40 rural biogas companies have been established and supported in all the 30 districts of Rwanda. Since the beginning of 2012, with support from SNV, a solar product dissemination component has been tested through the biogas distribution channels. 10 biogas companies have diversified and added solar lighting solutions to their range of products and services. By doing so, SNV aims to improve market penetration and address the challenge of "last mile" distribution, reaching presently underserved areas by complementing/working in synergy with ongoing initiatives.

Since 2007 supporting the business diversification of biogas companies, SNV (in collaboration with NDBP) has been supporting biogas construction companies. The support entails:

- Private sector development: supporting establishment of biogas construction companies and building their technical capabilities through vocational training and business capacities to help create a skilled workforce and provide job opportunities for youth;
- Technical support: standardisation, quality management, research & development and quality monitoring systems;
- Market linkages: support to build a biogas market and create linkages to farmers through promotion, marketing and networking including women associations, local authorities and sectoral NGOs/associations;
- Access to finance: setting up of a subsidy system, a biogas credit scheme and channeling funds to farmers through Banque Populaire du Rwanda and Umurenge Savings and Credit Cooperatives.

SNV's support and delivery mechanism to the private sector (Biogas) can be summarised in the diagram below:

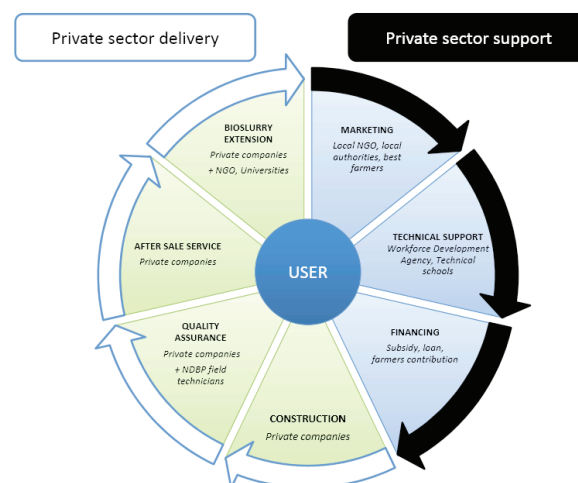


Figure 1 - Source: Owekisa Dominique / Anaclet Ndahimana

METHOD / SNV INTERVENTION

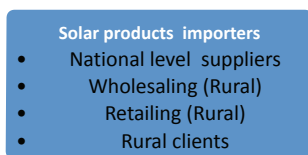
Starting February 2012, SNV Rwanda initiated a partnership and signed an agreement with Barefoot Power to improve the solar products' distribution in Rwanda by utilising the already established national distribution network of biogas companies which consists of more than 60 companies (at least 2 per district). Barefoot Power, an international solar distribution company, accepted to supply quality (certified) solar products to biogas companies with clear product guarantee conditions. Barefoot also brings services to end-users and retailers such as technical assistance and training in lamp use,

maintenance and replacement. The biogas companies were sensitised on the benefits of integrating the new technology in their business and quickly understood that by diversifying their renewable energy business, they could achieve greater renewable energy specialisation and recognition, increased incomes and rural market penetration, mutual promotion of products and, last but not least, client satisfaction.

SNV specific support with solar technology to biogas companies includes:

- Technical support: Company staff were introduced to solar technology, sizing, operation and maintenance and business development
- Market linkages: Biogas and solar are offered as a package to rural people, with an adapted sensitisation and promotion strategy and tools
- User's pre-sale services: The farmer's are facilitated to understand their energy needs and benefits of biogas and solar, with details on required product capacity/size and related costs
- Access to finance: The existing biogas subsidy scheme and credit scheme were adjusted to accommodate the relatively new solar product. Countrywide through districts, preferential rates and simplified procedures have been negotiated with sector based saving and credit cooperatives (SACCOs); In addition, being part and registered into biogas business could facilitate stock pre-advancement with BAREFOOT LTD.

The generic solar products distribution channel could be illustrated as follows:



* Transport is cross-cutting

Actors	Effectiveness gaps	Barefoot strength
Mainly multinational companies	- Limited investements in developing the supply chain (Rural)	- Long term vision and local presence
	- Difficulties to find effective dealers	- Sells quality and certified products
	- quality and certified products	- Recruit and support local dealers
	- No Guarantee (Quality) , aftersale services	- Offers guarantee and after sale services
	- No steady stock availability	- Stock pre-advance



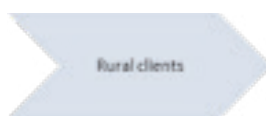
Actors	Effectiveness gaps	Medium size Biogas companies strength
Very few private actors, mainly in Kigali / Some provincial cities	<ul style="list-style-type: none"> - Lack of up-front investements (Access to finance) - Lack of business skills 	<ul style="list-style-type: none"> - Access to finance services - Access to subsidy schemes - Credibility for stock pr-advance (part of Biogas network) - Liasing with suppliers for guarantee, after sale services



Actors	Effectiveness gaps	Small Biogas companies strength
Almost non existing	<ul style="list-style-type: none"> - Insufficient economy of scale/High overheads costs (Promotion, transport,...) - Lack of business and promotion skills - Lack of technical and minor maintenance skills 	<ul style="list-style-type: none"> - Mobility and local presence - Competitiveness due to diverse renewable energy offer - Business and Promotion skills - Technical skills - Maintenance skills - Access ti finance services



Clients	Effectiveness gaps	Biogas companies promotion strength
Mainly urban people (Kigali and some provincial cities)	<ul style="list-style-type: none"> - Limited energy budgeting - Lack of awareness on renewable products benefits, costs and services - Limited access to finance, no dedicated loan scheme - No dedicated subsidy scheme 	<ul style="list-style-type: none"> - Integration of solar products into existing compains on renewable energy and biogas - Facilitating rural people to understand their energy needs - Offer of dedicated loan scheme to beneficiaries - Solar product can be integrated into the biogas subsidy scheme depending on farmer's choice



OUTCOME

The start of the diversification process was challenging despite the fact that all the companies were motivated and agreed to start integrating solar power technology in their businesses, The low uptake was mostly due to lack of awareness about the new 'business', low technical knowledge, low entrepreneurial spirit and lack of start-up capital to invest in new stock. Companies also faced a promotional challenge, as solar lanterns were basically unknown to the general public. Companies were subsequently provided with technical support and coaching. At the same time, in order to create awareness and stimulate demand in rural areas, solar technologies were promoted through existing biogas channels (e.g. integration of solar as an option and an alternative to the biogas lamp on the biogas farmers' intake forms). Ten biogas companies have been involved in the expansion of the project so far, with two becoming respectively wholesalers for the East and Southern province.

Farmers now have the choice of investing in a biogas lamp or a solar lantern, and they can choose their best suitable solar packs from a variety of products. So far, 70% of farmers with biogas installations have opted for solar lanterns, thus saving gas for cooking. As a result, during the last financial year (July 2012-June 2013), the biogas companies contributed to 22.6% of Barefoot Power's gross sales in Rwanda. So far, in only one year 1023 solar products have been sold, directly benefiting 5422 people. In fact, within a variety of products, the Firefly (5-20 USD) and the PowerPack 5 watts (110 USD) were the most demanded, with a total 60,000 USD turnovers over 22 months.

TESTIMONIALS

"Barefoot Power Rwanda Ltd, a social for-profit enterprise providing solar lighting and phone charging solutions to rural off-grid areas, has successfully partnered with SNV Rwanda and its network of biogas companies. We can say that the on-going cooperation is very fruitful. Barefoot Power is benefiting from a good, organised and trained group of entrepreneurs, which enables us to reach out to all parts of Rwanda. Thanks to SNV and its previous project work we are provided with an attractive market entry point", **Georg Heinemann, Managing Director, Barefoot Power Rwanda Ltd.**

LESSONS LEARNED

"I started in biogas in 2009 and have so far built 92 biogas plants. In 2012, I decided to integrate solar lanterns into my business. Since then I have grown fast and become the biggest solar products supplier in the Eastern Province. I'm serving 5 other biogas companies and have sold more than 100 solar products." **Védaste Karabaranga, Owner and Manager, MOSECO Biogas Company, Eastern province**

"Solar integration has offered a wider choice to the clients, and then benefitted our business, I'm no longer hesitant to travel into remote areas, as I know that in case I don't sell biogas, I will at least be able to sell solar lanterns. Since then, I have increased my renewable energy business turnover, with solar accounting for 8,000 USD in one year. Solar products account for 30% of my total profits!" **Aimable Niyigena, Owner and Manager, AED Biogas Company, Southern province**

Some of the key lessons learnt include the following:

- Different renewable energy technologies could leverage each other's distribution network and related services for rural market penetration
- The distribution channel described above has not tackled all the structural deficiencies described in the context section, mainly the distribution channel testing was on sustainable market creation and the establishment of an efficient last mile retailing system (supply and demand), however additional efforts could be made in terms of policies, regulation and access to finance, as well as upscaling the tested idea at national level with an increased number of actors
- There is still room to integrate in the tested channel, additional renewable energy products in addition to biogas and solar
- The supply chain testing described in this case study was a feasibility check for an innovative business idea. It also deepened the understanding of renewable energy technology needs, winning synergies and customer behaviour/benefits, which in turn will contribute to effectively reaching the last mile rural client. To this end, one of the possible solutions could be an efficient and inclusive business system with its own revenue mechanism; the **off-grid energy pipeline**.

In tapping into an off-grid energy pipeline (managed by a third party), investors/distributors/retailers would automatically connect to an efficient and pre-established structure, thus incurring minimum investment for:

1. Advocacy for favorable policies at National and District level (District performance contracts)
2. Marketing, promotion, demonstration, sensitisation (including mobilisation of local entities) and developing tools for the related information technology.
3. Quality standards, regulatory systems and certification
4. Strengthening the technical and business capacity of rural wholesalers, retailers and installers
5. In the case of foreign investors/manufacturers, possibility to connect to financially and technically capable local partners/ investors
6. Suitable financial services for the investor, distributors and end-user households (In some cases, subsidy schemes), as well faster carbon credit schemes.



Eng. Anacleto Ndahimana

Figure 2- Source: Anacleto Ndahimana

SOURCE

In addition, the off-grid energy pipeline would provide an exchange platform, thus strengthening knowledge/experience sharing, problem solving and innovation (technological and business). However, the off-grid energy pipeline would need to gradually materialise, as each sub-component would need its own protocols and stakeholder engagement.

- Integrated Household Living Condition Survey - EICV 3
- Economic Development and Poverty Reduction Strategy- EDPRS 2
- Barefoot Power Ltd database, Georg Heinemann
- SNV Rwanda solar through biogas pilot project proposal document for

Period of SNV contribution to this case study	Jan 2012 – Dec 2013
Financial resources invested /source of funding (DGIS/ name other donors) for period mentioned above: -Number of days and total costs of PPD SNV (DGIS) -Program support costs (DGIS)	Anacleto Ndahimana, 44 PPDs (22 PPDS/year) 9988 Euros (4994 Euros/ year)
Relevant partnerships, other than donors mentioned above	Barefoot, EWSA
Client satisfaction and enhanced capacity scores on outcome and impact. Mention date of measurement:	High, 15/08/2013

the 5th EEP call, October 2012, Anacleto Ndahimana.