



Grameen Bank, Bangladesh's unique community development bank, uses microfinancing, cellphone technology and renewable energy to improve the lives of the country's rural poor

## Affordable renewable energy: How microfinancing powers rural Bangladesh

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### EXECUTIVE SUMMARY

Simple household engineering breakthroughs supported by microfinancing are saving lives and making dramatic improvements in the productivity of Bangladesh's rural poor. This experience is clearly transferable to other developing nations as well as to poorer rural areas in the West.

Nadim Khandaker, an adviser to Nobel laureate Muhammad Yunus, the man responsible for the global micro-credit movement, and Shirya Rashid describe how small steps produce big

results with the backing of a progressive bank. With loans as small as \$30, microfinancing has brought to isolated areas advances such as cellphone coverage, simple solar panels that power a home for several hours a day and more efficient cooking stoves that reduce the noxious fumes that annually kill millions of people around the globe. At the same time, locals are trained to operate and maintain the equipment, creating a more sophisticated workforce.

### EXPANDED MICROCREDIT

Bangladesh's unique community development bank, Grameen Bank, has been promoting renewable energy in rural regions of the impoverished country since 1996. Founded in 1983 by economist Muhammad Yunus, Grameen Bank is responsible for the global micro-credit movement, which provides small, collateral-free access to capital for the poor to start small business ventures. In Bangladesh, loans of as

little as \$30 have helped the rural poor establish businesses that have thrived over time.

In 2006, when Yunus and Grameen Bank won the Nobel Peace Prize, he estimated that 100 million poor people around the world benefited from microcredit (Yunus, 2007). Yunus and Grameen Bank have since expanded the microcredit program to finance both profit-making and non-profit-making ventures that have, among other things, brought

cellphone and Internet service to remote Bangladesh villages.

As recently as 1996, only 400,000 phones existed in Bangladesh with a population of 120 million people. This was the lowest rate of telephone penetration in the world at the time. Moreover, no land-line telephone service existed in most of the country's 80,000 villages. In the same year, the government granted a licence to Grameenphone to provide mobile phone service throughout Bangladesh, particularly to its rural areas. By 2005, Grameenphone had eight million cellphone customers, and two years later the company had become the largest tax-generating company in Bangladesh, with more than 16 million subscribers (Yunus, 2007).

Through its visionary thinking, Grameen Bank further utilized cellphone technology to empower Bangladesh's rural poor. It provided loans to women to buy mobile phones and sell phone service to others for a commission. In this way, Grameenphone has been highly successful in applying advanced technology concepts and products from the developed world to rural Bangladesh to improve villagers' quality of life and economic conditions (Yunus, 2007).

Known as social businesses, the ventures supported by Grameen Bank have a social objective as well as operating as a normal business enterprise to generate revenue to repay owners for their investment (Yunus, 2007). Successful examples in rural Bangladesh include companies that market and provide renewable energy with the added social objective of local employment generation and promotion of better health through the products they market.

## RENEWABLE ENERGY FOR RURAL BANGLADESH

Grameen Bank has spawned a number of subsidiary social businesses including Grameen Shakti (meaning "rural energy" in Bangla). Grameen Shakti has installed more than 100,000 solar-panel systems in rural Bangladesh (Barua, 2009) and plans to install one million more for homes by 2012 (Yunus, 2007). As more people become trained in installation and upkeep, this target will likely be revised upward to serve the country's some 12 million rural households.

Though the solar units are small in scale, with the capacity only to charge a car battery, they can usually supply power for several light bulbs for a few hours a night, or to operate a television set or to charge a cellphone. Nevertheless, this small amount of power has spurred life-changing achievements in rural Bangladesh, where only 20 per cent of the people are connected to any electric power distribution network.

However, that 20 per cent figure is misleading since even grid-connected households do not have electric power for substantial periods of the day or night. Having additional artificial lighting a few hours a night from solar panels means enhanced productivity for those homes. Children can do their homework, and parents can engage in a variety of productive endeavours, including operating a home business.

The Grameen Shakti solar home systems can be bought by paying small monthly instalments over two to three years (Yunus, 2007; Barua, 2009). The success of the Grameen solar program has led enterprising villagers to set up microbusinesses based on the energy supplied by the units. Typically, a solar-unit owner will supply power to nearby households or shops for a fee, thereby serving as a micropower distributor.

Entrepreneurs are also establishing fee-charging community TV kiosks or cellphone stations powered by solar energy. As well,

Grameen fosters micro-enterprises based on solar-powered battery-charging stations, where battery-powered bikes and tricycle taxis pay a fee to power their batteries.

To support the rural solar industry, Grameen Shakti teaches women to install and maintain the units. Educated at Grameen technology training centres, the certified technicians then provide their services for a fee. By fostering solar energy, Grameen is also helping create a high-skill service industry based on market needs. And they are accomplishing this without the help of government programs or subsidies.

## THE 'IMPROVED COOKING STOVE'

Although Bangladesh's industrial sector is growing at a robust rate, this development is largely restricted to urban areas that devour most of the available primary energy fuels. The rural majority do not have access to, nor can they compete monetarily with, the industrial concerns for energy essentials such as natural gas or petroleum products.

Instead, these people must rely on dried biomass (jute or other plant stack, or even dried cow dung) to cook with. The more traditional homemade cooking stoves constructed with alluvial mud mixed with cow dung are thermally inefficient and generate smoke and fumes that are hazardous to health.

According to the UN, some 1.9 million people worldwide die as a result of this air pollution, and the victims are typically society's most vulnerable—women and children. Indeed, while cooking food to feed their families, the women of rural Bangladesh pollute their lungs analogous to smoking several packs of cigarettes a day (Behera and Jindal, 1991; Perez-Padilla et al., 1996). And their foraging for firewood for these poisonous stoves results in unwelcome deforestation that contributes to global warming.



Biogas cooking stoves, which use fuel generated from the anaerobic digestion of waste cow dung, are transforming rural Bangladesh. A family with two cows can generate enough biogas to meet its daily cooking needs

To try and address this energy and public health problem, Grameen Shakti has introduced its Improved Cooking Stove. Although these stoves use biomass, they are more energy efficient and are designed to vent out smoke, thereby reducing the exposure to direct air pollution.

There are two categories of improved stoves—one for a single household, which costs US\$10 and is paid in two instalments, before and after construction of the stove over a three-month period (Barua, 2009). This financing scheme reduces the upfront costs to the average rural household. Grameen Shakti reports that their stoves' fuel efficiency reduces primary fuel costs by US\$3.50 per month.

The second type of stove, a commercial variety, is sold to small roadside hotels (shanty hotels, commonly known as dhabas) for US\$100, which customers pay in six monthly instalments (Barua, 2009).

Clearly, the financing program is working. Between January and September 2009, Grameen Shakti sold approximately 20,000 of its stoves (Barua, 2009). Production bottlenecks and the small number of trained staff are restricting even greater sales.

For more affluent farming families, Grameen promotes anaerobic digesters for biogas generation. These primarily in-ground concrete digesters use waste cow dung to fuel household stoves. A family owning more than two cows can generate sufficient biogas to meet its daily cooking needs. Grameen is also marketing its anaerobic digesters, with some success, to small-scale poultry farms to utilize biogas generated from poultry waste. Furthermore, Grameen has plans to expand the application of biogas digesters to other high biochemical oxygen demand waste, generated from agro-based and other industrial concerns.

While Grameen Shakti offers attractive financing schemes, multiple farming families often purchase a single digester with connecting hoses to supply biogas to several households. The price of these digesters varies, depending on the size and costs of raw materials available in the remote rural region where the digesters are being constructed. Typically, the digesters range in size from two cubic metres to 12 cubic metres. A two-cubic-metre digester serving a single biogas cooker for about US\$200 can provide the daily cooking needs of a family of six people (Barua, 2007). A larger, six-cubic-metre digester, serving the cooking needs of 20 people (four families), would cost about US\$400. By 2009, Grameen had installed 8,000 digesters and reported an anticipated demand for 500,000 new digesters by 2012 (Barua, 2009).

To promote local employment, Grameen Shakti trains local youth to build, operate and maintain the digesters. They then can market their services. The same technicians are also trained in the installation and maintenance of the Improved Cooking Stoves. Construction of these stoves and anaerobic digesters in rural Bangladesh is extremely labour intensive. It involves non-powered tools, such as shovels and pickaxes, manual mixing of cement and carrying construction materials, often by human pedal-powered rickshaws over unpaved roads. Materials such as bricks and mortars are carried on bamboo scaffoldings.

## LESSONS FOR ONTARIO AND THE DEVELOPED WORLD

Although the Grameen Shakti success story may not apply universally, it provides an alternative or complementary strategy to subsidy-based or guaranteed-pricing based renewable energy programs, at least as a social business model on the community level.

In an engineering context, policy-makers in developing countries

should note that appropriate technologies, such as the Improved Cooking Stove and the rural biogas digester, can help meet the demand for primary fuels. This is more relevant in rural populations where infrastructure links for power and transportation are severely limited.

In a broader context, appropriate technologies for energy efficiency also limit greenhouse gas emissions and the foraging for firewood, thereby helping to limit deforestation and other environmentally harmful practices. Furthermore, as the example of the improved cooking stove shows, having such a product limiting women and children's exposure to direct air pollution has long-term beneficial health impacts. Overall, the Grameen business model for promoting renewable energy technologies based on microfinancing shows that if a product meets the needs of a particular community and the financing structure enables the people to have access to the technology, this model of engineered product promotion should translate successfully, at least to other developing countries. In fact, the U.S. government announced in September that it will spend about US\$50 million over five years to provide 100 million clean-burning stoves to villages around the world.

Clearly, the green energy products Grameen Shakti markets meet a consumer need. Grameen also provides the less-affluent consumer with access to credit to fulfill that need. Furthermore, these products have an added public health benefit. And they offer local labour the opportunity to be trained to install and service the products, thereby creating lasting skilled employment. In short, the Grameen Shakti renewable energy initiative is free-market capitalism with a social mandate for the betterment of society.

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