

Green Jobs Opportunities in Grameen Shakti's Programs

By

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**Prepared for presentation at the Workshop on Green Jobs
Initiatives in Bangladesh**

**Jointly Organized by Ministry of Labour and Employment, Government of
Bangladesh and ILO, Bangladesh**

30 July 2008

**Hotel Sonargaon, Dhaka
Bangladesh**

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Abstract

Bangladesh is an overpopulated and energy starved country. Unemployment, accounting more than 25-30% of the total population, is a serious problem of the nation for economic growth and draws urgent attention. Only 40% households are connected to grid electricity and less than 3% has access to piped natural gas for cooking. Promotion and expansion of renewable energy technologies are being taken up to the door steps of millions of off-grid rural people in remote and inaccessible areas by different NGOs and private companies. Grameen Shakti, established in 1996, is actively involved in pioneering and expanding green energy revolution to rural Bangladesh and shares more than 60% of the total installation of solar home systems, biogas plants and improved cook stoves. Grameen Shakti has evolved “**An Integrated and Sustainable Model for Bringing Light, Income, Health and Affordable Climate Friendly Energy to the Rural People**” which has created many job opportunities in the rural Bangladesh. By setting up a total of 507 offices Grameen Shakti has employed more than 2500 personnel. Grameen Shakti has the future plan of creating more than 100,000 green jobs in the rural areas by 2015.

By the time (as on 30 July 08), Grameen Shakti has installed 180, 000 solar home systems, and constructed 4500 biogas plants as well as made 16000 improved cook stoves(ICS). IDCOL, government owned private company is helping Grameen Shakti and other Partner organizations implement the renewable energy programs in the country. National Domestic Biogas and Manure Program are being funded by Netherlands Development Organization (SNV). Other donor agencies such as USAID, GTZ, etc are also helping biogas and ICS programs. Grameen Shakti has the expansion program of installing 1 million solar home systems by 2012, constructing 50,000 biogas plants by 2010 as well as making 2 million ICSs through the different financial models. The number of Grameen Technology Centers (GTCs) established for creating more green jobs and empowering women, who are worst victims of poverty and fuel crisis, through training on renewable energy technologies will be increased to 105 by 2010. More than 1000 Women Green Entrepreneurs, created through the GTCs, have set up their own business at home and market places assembling and marketing solar accessories. About 5000 users' training has so far been completed so that these trainees can maintain their own SHSs. Exposure training for more than 9000 school students has so far been completed. Grameen Shakti has already trained about 1000 mason men to accelerate the biogas program. Nearly 33 chimney manufacturing units have been set up through seed capital under management and technical assistance of Grameen Shakti for smooth supply of chimneys. Grameen Shakti is the creator of three entrepreneurs and engaged them to supply different grates. Grameen Shakti has trained more than 1000 technicians who will in turn train others and also manufacture, promote and repair improved cook stoves. Grameen Shakti sees a potential market of at least 0.5 million ICSs in the first three years of the program. Bioslurry organic fertilizers obtained as byproduct from biogas plants are being popularized through demonstrations in the farmers' fields. It is expected that many fertilizer dealers will be involved in marketing of this environment friendly organic fertilizer. Biofuel on Jatropha as well as Clean Development Mechanism (CDM) projects on solar home systems and biogas have been initiated and will engage many youths for community benefit programs.

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Background

Bangladesh is an overpopulated and energy starved country having lowest consumption of energy. Unemployment, accounting more than 25-30% of the total population is a serious problem of the nation for economic growth and draws urgent attention of the government. More than 60% of the population does not have access to grid electricity and only a mere 3% has access to piped gas. A country starved of energy cannot develop economically. The rural poor are the worst sufferers especially women. People largely depend on biomass fuels such as wood, crop, and animal residues for household energy related activities, primarily cooking.

In recent years, Grameen Shakti (GS) has emerged as a key player in promoting renewable energy technology in remote, rural and off-grid areas of Bangladesh. A member of the Grameen family, the organization started its activities in 1996, as a not for profit company - to promote, develop and popularize renewable energy technologies in remote rural areas of Bangladesh. At present, GS is working in all 64 districts of Bangladesh. It maintains a four-step organizational structural: Head office, 10 Divisional offices, 67 Regional Offices and 387 Unit offices, serving more than 800,000 beneficiaries through 1237 employees among whom over 900 are engineers. Its four main programs are Solar PV technology, Biogas technology, Organic Fertilizer and Improved Cook Stove. Work on biofuel with Jatropha has been initiated as a pilot program.

Vision

Grameen Shakti envisages a future where rural households of Bangladesh would have access to environment friendly and pollution free energy at affordable cost. It has the future plan of creating more than 100,000 green jobs in rural Bangladesh.

Mission

Grameen Shakti promotes and delivers renewable energy technology services to people of remote and rural areas of Bangladesh, at affordable cost, to reduce poverty and improve the quality of life.

Program Approach

Through program approach Grameen Shakti has initiated activities for:

- Promoting and developing renewable energy technologies such as solar, biogas, organic fertilizer and improved coke stove.
- Diversifying and increasing the application of renewable energy technologies for productive purposes to meet the needs of poor people in rural areas.
- Designing effective financial mechanism based on credit support & installments to make renewable energy technologies more affordable to the poor.
- Conducting research to develop new and appropriate technologies to provide more cost effective energy services to the poor and reduce dependence on imported energy sources.
- Disseminating and transferring appropriate environment friendly technology to the local communities by providing training and building awareness on renewable technology and environment.

1.0 Solar Power Program



In view of the growing fuel crisis worldwide and depleting natural gas within the country, it will also not be possible in the near future to extend the grid system to connect significant number of households, shops, business centers, commercial and other institutions situated in the remote villages of Bangladesh. The country's power systems almost entirely run on fossil fuel discharges carbon dioxide thereby negatively affecting the environment.

In this context, Grameen Shakti has been selling, installing and maintaining environment-friendly solar power systems to rural communities at affordable prices. To facilitate this service, Grameen Shakti has also been extending necessary credit support to these communities and has installed over 180,000 solar power systems till date. Daily power generation capacity is around 34 MW/h.

1.3. Credit Support for Solar Power System Installation and Mode of Repayment

Grameen Shakti has used micro credit to develop one of the first successful market based models to take renewable energy technologies to rural people. This financial package is based on installment payments. This reduces costs with providing any subsidies. Grameen Shakti believes that a product should sell because it enjoys high demand, not because of subsidies.

Grameen Shakti has advocated and succeeded in establishing pro-friendly renewable energy policies in Bangladesh. Grameen Shakti's single greatest contribution is the adoption by the World Bank of the Grameen Shakti model to expand renewable energy policy in Bangladesh through the Infrastructure Development Company Ltd (IDCOL) project.

IDCOL, a public Limited Company, took up a project to install 50,000 solar home systems from 2003-08 through private companies/NGOs and allocated a budget of US\$ 20 million. Instead of direct implementation, IDCOL provides soft loans and technical assistance to private companies interested in Solar PV technology. This project has become one of the most successful initiatives taken by the Government. By 2005, 50,000 Solar Home Systems (SHSs) have been installed, three years ahead of schedule. Grameen Shakti alone has installed 65% of 50,000 SHSs. Bangladesh has become one of the countries with the fastest growing Solar PV program in the world. The project has been extended and now it also includes a program to support biogas technology which means **Bringing Light and Energy to One Million Rural Households**.

Grameen Shakti has opened the door of immense opportunities for the rural people. The rural people live in a vicious cycle. Because of their lack of economic power, they cannot efficient energy; this in turn limits their economic and business activities. Additionally, they face environmental and health hazards because of their over dependence on traditional energy sources, such as biomass and fuel wood. Lands are denuded of trees and foliage. Women and children suffer from air pollution and related diseases.

Grameen Shakti is like a ray of light and hope for this grim picture. It's solar including biogas and improved cook stoves programs reduce dependence on kerosene, wood and biomass bringing in environmental benefits. Thousands of women and children are benefiting from these programs. They do not have to suffer from indoor air pollution. These women can use biogas and improved cook stoves for cooking.

Taking into consideration the financial ability of rural communities, Grameen Shakti has been selling and installing solar power systems through three different payment schemes:

Mode of	Down	Installment	Service
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repayment	payment		charge (Flat rate)
Option-1	15%	36 months	6%
Option-2	25%	24 months	4%
Option-3	100% cash payment with 4% discount		
SHSs	Min 15%	24-36 months	6%

With a view to reaching the poorer communities, Grameen Shakti has initiated the **micro utility** financial model. This scheme allows a shopkeeper or a client to access a solar power system with only 15% down payment. They can share the system with other households or shops for a fee and can become outright owners of the system following payment of 36 monthly installments without any additional service charge. Presently, around 10,000 clients have availed the **micro utility** system.

1.5 Maintenance of the System

Grameen Shakti provides 3 years maintenance services for the solar power system. After the 3 year period, Grameen Shakti enters into yearly maintenance contracts at an affordable cost of Tk. 300. Furthermore, it provides training at its own cost to all clients, interested youths and women on maintenance of solar power systems. Every client that repays in full receives a certificate and an umbrella carrying Grameen Shakti name and logo. Grameen Shakti also provides a clock to clients who enter into maintenance contracts with them.

1.6 Benefits of Solar Power Program

- Grameen Shakti has installed more than 1, 80,000 solar home systems throughout the country with a total electricity production capacity of more than 34 MW/h.
- Improved lighting through solar energy has led to enhancement in children's education, household members' recreation and other production oriented activities.
- Solar lighting has extended working hours in rural markets and business centers after dusk that in turn has led to opportunities for extra income. The use of solar powered computers has contributed to further developing the technical skill base.
- Access to solar power systems protects rural women from the health hazards of using and maintaining traditional kupa or hurricane lamps.
- Rural communities now have the opportunity to become owners of solar home systems for almost the same price as kerosene.
- The use of solar home systems has created direct and indirect scope for new income generation and employment opportunities.

2.0 Grameen Technology Center

GS has set up 30 Grameen Technology Centers (GTCs) under a pilot program to scale up its solar program, especially production of SHS accessories by manufacturing these locally. More than 1000 rural women have been trained as solar technicians to market, install, repair and maintain solar home systems. GS will help these technicians to sign annual contracts with its clients for after sales



maintenance and become entrepreneurs in the future. About 5000 users' training has so far been completed. More than 90 thousand people each year are installing SHSs all over Bangladesh for business or household purposes. Grameen Shakti alone plans to install one million SHSs by 2012. Grameen Shakti's envisages a future where there would be a huge demand for SHS accessories as well as maintenance services to keep the installed SHSs in working order. GTCs are also running a very successful Renewable Energy Exposure Program for rural school children and more than 5000 school children have participated in the program.

Grameen Shakti plans to use the GTCs to meet the projected demand for repair/maintenance services and SHS accessories at affordable costs. The GTCs will train women technicians and use them to produce the accessories. They will also strengthen and expand the back-up services at the local level. Grameen Shakti will also use the GTCs to train women members from the user households. Grameen Shakti thinks that they will be able to look after the SHSs because in Bangladesh, women are responsible for managing household activities.

Grameen Shakti plans to set up 105 GTCs by 2010. These GTCs will act as resource centers for developing renewable energy entrepreneurs at the local level. These resource centers will help adapt renewable energy technologies to the Bangladeshi context and then pilot test them for commercialization. At the same time, these GTCs will train renewable energy entrepreneurs and link them up with different technical and financial institutions.

3.0 Biogas Program

Biogas is another potential renewable energy source in Bangladesh. Grameen Shakti has, therefore, undertaken construction of biogas plants as an alternative to the energy produced from firewood, the cutting and burning of which is harmful for the environment. The technology uses cow dung, poultry droppings, water hyacinth and other biomass waste to produce biogas, thereby ensuring a smoke-free, odor-free, clean and healthy cooking environment for rural women.

Among the 25 organizations involved in transferring the biogas technology, Grameen Shakti is the lead organization which shares more than 60-70% of biogas plants being constructed in the country.

The introduction of biogas has reduced the time that the rural women spend on cooking, in turn allowing them to engage in other productive pursuits. A three cubic meter biogas plant is capable of producing sufficient gas for cooking three meals a day for a family of 6-8 members. Grameen Shakti mainly provides support for installing 6-20 m³ capacity biogas plants. The owners of these biogas plants, after meeting their own requirements, sell extra gas to nearby families, restaurants, tea-stalls and bakeries. Some owners also use biogas to generate electricity for their own use. For smaller sized biogas plants of 1.2 to 4.8 m³ capacities, Infra Structure Development Company (IDCOL) implements through different partner organizations including Grameen Shakti in a National Domestic Biogas and Manual Program (NDBMP). This program is financed by Netherlands Development Cooperation (SNV) where there is provision for giving grant of Tk 7000.00 per biogas plant irrespective of sizes.

3.1 Credit Support for Biogas Plant Construction and Mode of Repayment

This financial support both for Grameen Shakti & IDCOL Model may be seen under the 3 attractive options through which a customer can own biogas plant:



Option-I

1. A customer wanting to build a biogas plant of 6 -9 m³ capacities can make 60% down payment at the time of construction and the rest 40% along with 6% service charge (Flat rate) will have to be paid in 24 installments within two years.

2. The customer wishing to build a biogas plant of 10- 20m³ capacities will have to pay 70% down payment at the time of construction and the rest 30% along with 6% service charge (Flat rate) will have to be paid in 24 installments within two years.

In both above cases, the customer will have to pay 10% technical and supervision fees of the total cost.

Option-II

A customer can bear all the cost of the biogas plant by himself/herself without taking any loan from GS. In that case he/she will have to pay 15% technical and supervision fees- half of them before construction and the rest amount after construction of the plant.

Option- III

A customer wishing to get grant of Tk 7000.00 from IDCOL can build a biogas plant of 1.2- 4.8 m³ capacities. In that case, he/she will have to pay 15% down payment of the remaining total amount after subtraction of grant money. Like other options, he/she will have to pay 15% technical and supervision fees and the loan money along with 6% service charge (Flat rate) will have to be paid in 24 installments within two years.

Mode of repayment	Size of biogas (m ³)	Total approx. cost(Tk)*	Down payment of total cost (%)	Technical and supervision fee (%)	Installment/ month	Service charge (Flat rate)
Option-1 (GS model)	6 -9	45000-60000	60	15	24	6%
	10-20	65000-200000	70	15	24	6%
Option-2 (GS model)	Customers own cost			15	-	-
Option-3 (IDCOL model)	1.6—4.8	11645-25245	15	10	24	6%

*** All prices are subject to changes and revision**

The size of the biogas plant either small or large depends on the number of the family members and cows or also on the amount of poultry litter generated from farm. In that case the total construction cost will increase/decrease. Therefore, the amount of down payment will depend on the size of the plant and total construction costs.

3.1 Use of Biogas

- Biogas can be used for cooking like natural gas



- Biogas can be used for lighting rooms with using mantel of hazak light
- Biogas can generate electricity to power appliances like light, fan, TV, radio etc.
- Biogas can be transformed/converted into mechanical power for pumping irrigation water

3.2 Advantages of Biogas Technology

- Produces clean and efficient fuel.
- Slurry, a byproduct of the biogas plant, is a high quality organic fertilizer that can be used for crop and fish production and mushroom farming.
- Protects women and children from indoor air pollution and related diseases.
- Keeps the environment clean.
- Prevents deforestation and protects the environment.
- Can be easily, safely and conveniently used as natural gas.

Grameen Shakti has constructed about 4500 biogas plants, all of which are successfully generating biogas. Grameen Shakti's strategy is based on intense grassroots marketing and three attractive financing options.

4.0 Organic Fertilizer Program

Grameen Shakti produces a high quality organic fertilizer from the bioslurry, obtained as a byproduct from the biogas plants. This environment-friendly organic fertilizer has been named by Nobel Laureate Dr Yunus as "Grameen Shakti Jaibo Sar". A cow dung operated biogas plant with the capacity of producing 3 m³ biogas produces over six thousand kilograms of bioslurry as a byproduct per year. This bioslurry is equivalent to about 200 kg of urea, 1100 kg of TSP and 110 kg of MP fertilizer. The plant owners can earn more than Tk. 24,000 yearly from a plant of 3 m³ by selling bioslurry organic fertilizer at a minimum rate of Tk. 4 per kg.

In addition to primary nutrients (NPK), bioslurry organic fertilizers contain considerable amount of secondary and micronutrients. Toxic metal concentration in them is minimal. They also contain humus and plant stimulants. The bioslurry produced from poultry droppings contains more nutrients than that produced from cow dung.

Due to changing scenario of soil fertility management through **Integrated Plant Nutrition System (IPNS)** that combines the use of organic and chemical fertilizers, bioslurry organic fertilizers play a vital role in restoring fertility as well as organic matter status of the soils. Organic matter content in Bangladesh soils is alarmingly low around 1% in most and 2% in few soils, whereas it should be maintained at least 3% that is conducive to high crop productivity.

As mentioned before, bioslurry organic fertilizer is environmental friendly and has no toxic or harmful effects, and can reduce the use of chemical fertilizers up to 30-40%. Nutrients from organic sources are more efficient than those from chemical fertilizers. Poultry litter bioslurry is especially suitable for acid soils as it has strong liming effect. Bioslurry is a 100% organic fertilizer most suitable for organic farming for some high value field and horticultural crops.

4.1 Field trials

Grameen Shakti has started to conduct a large number of field trials in the farmers' fields to show the beneficial effects of bioslurry organic fertilizers on the growth and yield of different



crops. During the last Boro season (2007-08) 40 demonstration and 2 research trials were carried out. These trials have shown promising results of bioslurry organic fertilizers.

5.0 Wind Energy Program

Grameen Shakti has been conducting research to tap wind energy in the coastal areas of Bangladesh and has installed four wind-diesel hybrid systems in four cyclone centers of Bangladesh. The objective is to provide electricity to promote micro enterprises in these shelters.

The present phase of the wind energy program is focused on gathering financial and technological data for possible future expansion in other areas.

6.0 Improved Cook Stove (ICS) Program

Grameen Shakti has been making and promoting improved cook stoves in the rural communities. Compared to traditional stoves, improved cook stoves are more efficient both in terms of reducing the amount of biomass consumed by 40-50% as well as generating greater levels of heat. It is also more environments and health friendly as it can reduce deforestation, emits lower levels of carbon and smoke. It can protect the health of million of rural women. Grameen Shakti has so far constructed more than 16000 through 1000 ICS technicians cum entrepreneurs. Nearly 33 chimney manufacturing units have been set up through seed capital under management and technical assistance of Grameen Shakti for smooth supply of chimneys. Grameen Shakti is the creator of three entrepreneurs and has engaged them to supply different grates. Grameen Shakti has taken up a program to train a large number of technicians who will train others and also manufacture, promote and repair improved cook stoves. Grameen Shakti also plans to promote large scale production of improved cook stove to sell them on credit to the rural people for domestic and business purposes. Grameen Shakti sees a potential market of at least 0.5 million ICSs in the first three years of the program.

The present ICS program on both family size and commercial size undertaken by Grameen Shakti may be summarized as follows:

Family size

- Model I: 1 Mouth with Grate and Chimney
- Model II: 2 Mouths with Grate and Chimney

Commercial size

- Model III: 3 Mouths with Grate and Chimney

The size and shape of Model III will vary depending on the needs and requirement of the organization.

The detailed cost and financial facilities as provided by Grameen Shakti can be viewed from the following table.

Size	Model	Line items	Cost (Tk)
		Material (grate, chimney& cap)	500.00



Family	I	Technician fee	200.00
		Technical and supervision fee	100.00
		Total cost	800.00
	II	Material (grates, chimney& cap)	600.00
		Technician fee	300.00
		Technical and supervision fee	100.00
		Total cost	1000.00
Commercial	III	Material (grates, chimney, cap, bricks & rod)	3400.00
		Technician fee	600.00
		Technical and supervision fee	1000.00
		Total cost	5000.00

6.1 Credit Support for Improved Cook Stove and Mode of Repayment

Three attractive financial packages of Grameen Shakti through one of which a customer can be owner of ICS may be described below:

Option-I

An owner of household can have one ICS by making 50% down payment before construction and the remaining 50% just after construction of the ICS.

Option-II

A household owner can bear all the cost of the ICS without taking any loan by paying only 15% technical and supervision fees to Grameen Shakti just before construction.

Option- III

A commercial organization or establishment wishing to avail attractive financial package of Grameen Shakti can have a large ICS by paying down payment of 50% before construction and the remaining 50% along with 6% service charge (Flat rate) will have to be paid in 6 installments within 6 months.

Because of promotional activities, more and more women are now switching to improved cook stoves. ICS reduces indoor air pollution and makes women lives easier. Commercial



organizations such as food industries, restaurant, hostels, and soap manufacturers have shown great interest in ICS.

7.0 Biofuel Program

Due to the crude oil price crisis that has occurred on global scale, the reduction of dependency on petroleum-based fuel is imperative. Protection of the environment is also a major concern. In Bangladesh economy, petroleum products play a vital role in the field of agriculture, transport, industry and households. Among the petroleum fuels, diesel oil is used more than 90% in transport and 100% in agriculture. According to the 2006 year's statistics, the total demand of fuel oil in the country was 3.6 million metric tons and diesel oil occupies 60% of the whole consumption. The government spends huge amount of foreign exchange every year to import fuel oil and also provides 30% subsidy on all imported oils. Dependence on oil imports is growing rapidly to meet the increasing demand amidst growing concern about the possible natural gas reserves diminishing soon event at the current rate of use.

Therefore, in order to meet the increasing demand of fuel oil in the country, it is now the high time to find an alternative energy options in the form of renewable energy sources for power generation and biodiesel to partially replace liquid fossil fuels.

Under the circumstances, the plant that seems most adapted for cultivation in the marginal and waste land, and also as a source of biodiesel, suiting the agro climatic conditions of Bangladesh is called *Jatropha*. This plant has the ability to grow under such adverse soil and climatic conditions and will be good for large scale cultivation in areas that are found to be not suitable for production of conventional cash and food crops.

Although *Jatropha curcas* is not new plant in Bangladesh, but as a source of oil producing plant it will call for substantial capacity development, knowledge dissemination, research and development to make production of biodiesel from *Jatropha* seeds a commercial viable proposition.

Plantation of *Jatropha* on pilot scale has been started at Chittagong and Rangamati.

8.0 CDM Project

Grameen Shakti has initiated clean development mechanisms (CDM) for two projects:

1. Installation of Solar Home System in Bangladesh
2. Dissemination of Biogas technology in rural households

Grameen Shakti has already signed Emission Reduction Purchase Agreement (ERPA) with World Bank for a cumulative amount of contract CERS 372,700 tCO₂e during the period 2007-2012. Grameen Shakti has been enjoying VER CDM benefits from biogas plants. VER is being purchased by one USA Company known as E+Co. The fund received is being utilized to demonstrate and popularize the use of bioslurry on various crops.

Future Plans

- Solar Program: Installation of 1 million SHSs by 2012
- Set up 1000 branch offices in the next 5 years
- Expand its rural base and scale up its program by developing renewable energy entrepreneurs
- Decentralize and scale up its production, marketing, repair & maintenance services by setting up 300 GTCs in the next 5 years
- Biogas Plants: Construction of 50,000 plants by 2010



- Initiate innovative models and develop appropriate strategies for the dissemination of biogas technology
- Initiate & implement projects on biogas using CDM support which will reduce biogas plant costs and at the same time develop funds
- Develop entrepreneurs who link biogas technology with poultry, livestock and organic fertilizer business
- Carry out a large number of demonstrations to popularize the use of bioslurry organic fertilizers among the farmers in an attempt to reduce dependency on the use of chemical fertilizers.

Grameen Shakti aims to further strengthen its position as a leader in the area of renewable energy and envisions around 10 million people of Bangladesh benefiting from its solar power, biogas, organic manure, improved stove and organic fertilizer programs by 2015.

Capacity Development & Regional Initiative

- Develop its training capacity to provide training, onsite technical assistance for disseminating and replicating GS model in coordination with other organizations
- Linkage with other organizations to develop capacity for large scale manufacturing of renewable energy technology accessories to provide these at lower cost both home and abroad.

