

**Workshop on  
Solutions to provide clean energy and safe drinking water  
in rural areas**

**– Opportunities based on biogas and poly-generation**

**20<sup>th</sup> Oct 2014**

**Dhaka, Bangladesh**



**Prepared by**

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## **Acknowledgements**

A workshop on “Solutions to provide clean energy and safe drinking water in rural areas – Opportunities based on biogas and poly-generation” was organized in Dhaka, Bangladesh as a part of activities under a research project “Biogas based poly-generation for rural development in Bangladesh”. This is a research project funded by the Swedish International Development Cooperation Agency (SIDA). We would like to express our sincere gratitude to SIDA for the financial support provided for this research work.

We are also very grateful to many persons and organization for their help and support for these activities. First, we would like to extend profound gratitude to our local partner “Grameen Shakti” for its continuous support. Special thanks go to Mr. Absar Kamal, Dr. MS Islam, Mr. MA Gofran and Mr. Mohammad Mahmodul Hasan for their valuable support to make the workshop successful. Special thanks go to invited key note speaker Prof Dr. M Alamgir (Vice-Chancellor of KUET) and Mr. Magnus André, Second Secretary from Swedish Embassy in Bangladesh/SIDA for their presentation input in this workshop.

We would also like to thank all the stakeholders from government, non-government sector, and plant developers, installation companies involved in the biogas energy sector of Bangladesh. Thanks are due to Mr Rajeev Munankami, Senior Advisor of SNV Bangladesh for his excellent support during this period.

We are also thankful to our Master Student (recently graduated) Mr. Saad Been Emran for his help in taking the notes and logistic support during these activities.

## Background

Understanding the symbiotic relation between energy, economic growth, environment and health is important while designing technical solution for meeting the multiple needs of rural people in developing countries. Solutions need to be explored looking beyond technology.

In this context, Royal Institute of Technology, KTH-Sweden along with Grameen Shakti as a local partner and SCARAB AB, a Swedish private company has proposed to look at the feasibility of a small-scale, biogas based poly-generation for providing rural energy services and clean drinking water. The innovative character of this poly-generation project is to devise a technical solution which can give three different outputs of high value and that are very important to meet the rural needs using low value resources such as animal dung and local agriculture residue.

In the starting of this project, a half-day workshop was organized on 15th July, 2012 in Dhaka jointly by KTH and Grameen Shakti inviting forty participants from 24 different organizations including governmental, non-governmental, donor organization, private companies and biogas plant owners. The aim of that initial workshop was to inform the stakeholder about the project and was also intended to have a focused group discussion among the stakeholders to identify the issues that are important in promoting new technological solutions like biogas based poly-generation in the rural context. The feedback from that consultation meeting was incorporated in defining and updating the project activities (See [Mainali, 2012](#)<sup>1</sup> for details).

This research project has mainly looked at (i) the techno-economic evaluation of the poly-generation system (ii) the potentiality of such system in a rural context considering the local energy demand and available resources (iii) appropriate business model for providing rural services with such technological system and (iv) GHG emission reduction potential of such technology if applied in a rural poultry or cow farm. Besides, this study also aimed at formulating strategies (from technology development to deployment) to implement such biogas based poly-generation in Bangladesh.

In order to discuss the preliminary results of the project so far and to get their feedback and also to formulate the strategies in consultation with the stakeholders, final workshop was organized in Dhaka on 20<sup>th</sup> Oct 2014 by KTH in association with Grameen Shakti. Prof. Semida Silveira, Team leader of this project and Head of Energy and Climate Studies (ECS) Division and Dr. Brijesh Mainali, researcher and coordinator of the project participated from KTH. Thirty six participants from 22 different organizations including governmental, non-governmental, donor, private companies and power plant owners were participated in the programme. Participants' list are listed in Annex I.

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<sup>1</sup> Mainali, 2012. Report on one-to-one stakeholder consultation meeting and a half-day workshop organized in Dhaka on 2012.

## **Objective of the workshop**

The workshop was aimed at sharing the preliminary results of the project with the stakeholders and discuss with them for their feedback. Besides, the workshop was also intended to have a focused group discussion among the stakeholders to formulate the strategies in case of implementing new technological solutions like biogas based poly-generation in the rural context.

## **Workshop Agenda**

A workshop on “Solutions to provide clean energy and safe drinking water in rural areas – Opportunities based on biogas and poly-generation” was held in Bangladesh by the Royal Institute of Technology KTH, Sweden in association with the local partner Grameen Shakti, Bangladesh on 20<sup>th</sup> Oct 2014. Workshop was divided into two sessions. First session was focused on sharing the project results for their feedback while second session was more focused on stakeholder consultation for preparing the strategies if this technological solution has to move further from technology development to deployment.



*Mr Abser Kamal (1<sup>st</sup> from the right), giving his welcome speech in the workshop*

## **First Session**

The workshop started with the welcome speech of Mr. Abser Kamal, Managing Director of Grameen Shakti. Mr. Kamal highlighted the role of Grameen Shakti in the rural development sector and shared his view on the development of new technological system for the rural development and reiterated the Grameen’s support and commitment for the further development of the project.

This was followed by an inspiring key note on “Challenges to address poverty and infrastructure needs in the rural areas of Bangladesh” by Prof. Dr. M. Alamgir, Vice-Chancellor of Khulna University of Engineering and Technology. Prof. Alamgir highlighted the positive relationship between infrastructure investment and economic growth as well as the existence of a strong connection between economic growth and poverty reduction. He highlighted about (i) the weak financial

performances of most of the public enterprises providing infrastructure services in Bangladesh, (ii) exclusion of most of the poor from the subsidies to infrastructure services and, (iii) lack of access to medium term and long-term debt financing as some of the key challenges for the sustainable development of infrastructures in the rural areas reaching the poor.

Prof. Dr. Semida Silveira, Head of Energy and Climate Studies division -KTH and team leader of this project presented important issues for addressing rural needs and promoting sustainable development. She highlighted that development efforts focused only on technology development and dissemination will not be enough to achieve sustainable development. Synchronization and strengthening of collaboration to improve systems, institutions and stakeholders' actions are also important. Both top down and bottom-up strategies are needed to address energy needs. Prof. Silveira also briefed about the project's objective, activities under the project and key partners' involvement.



Prof. Semida Silveira addressing the workshop

Dr. Brijesh Mainali highlighted the exiting problems associated with cooking fuel, electricity access and the drinking water and explained how the biogas based poly-generation technology can address these problems. He further revealed that laboratory tests have shown that the arsenic presence in the distillate water from the membrane distillation reduces from 1400  $\mu\text{g/liter}$  to 0.4  $\mu\text{g/liter}$ , which is in completely in the safe side as of WHO standard (less than 10  $\mu\text{g/ liter}$ ). This type of technological system is economically attractive with relatively shorter payback period of 2.4 to 4 years. Dr. Mainali also presented the case study analyzing the potential of such poly-generation system in a small rural community "Pani Para". The study had shown that the available local resources are sufficient to supply all the households with electricity and clean drinking water, and two-third of household with cooking gas as well. This scenario has been proposed considering both supply side and demand side constraint. The poorer sections of households have been proposed to be supplied with improved cook stoves so that they will also have better cooking environment.

Mr. Saad Been Emran, recent graduate from KTH, presented the climate change mitigation potential of poly-generation system in Bangladesh considering supply chain analysis. Revealing his study's finding, he highlighted that production of biogas from cattle dung or poultry litters from the cattle or poultry farms is not only economically attractive, but it also has a high environmental value with huge

climate mitigation potential. Use of digested slurry as a replacement of synthetic fertilizer would further increase the avoided emissions.

Mr. Magnus André, Second Secretary of Swedish Embassy in Bangladesh presented climate change and environment portfolio of SIDA. He highlighted that SIDA's present strategy for development cooperation with Bangladesh has focused mainly on poverty alleviation, access to quality and non-discriminatory social services like primary health, education. Besides, improving urban environment for the benefit of people living in poverty is also in their prime agenda, he mentioned.

Dr. MS Islam presented working experiences of Grameen Shakti in promoting new technologies in rural areas of Bangladesh. Dr. Islam highlighted that Grameen is one of the pioneer social enterprises of renewable energy sector in Bangladesh. Grameen has disseminated 1,392,76 solar home systems, 8,01,608 improved cook stoves and 28,518 biogas plants in Bangladesh as of April 2014. Innovative micro credit mechanism, wide spread institutional network of Grameen Shakti with 1,492 offices covering 50,000 villages in Bangladesh has helped in achieving this success.

### **Discussion:**

After presentations, the forum was opened for question answer and discussion. Dr. Islam expressed his view that nation's overall economic growth may not always guarantee the poverty alleviations. For the poor people living in the remote areas, industrial economic growth may not give any significant impact for them unless some specific poverty reduction programme are designed targeting their needs. Mr. André had also similar concern regarding the economic growth and poverty reduction. Prof. Alamgir agreed with the participants comments and further added that the economic growth of Bangladesh is not only based on industrial growth, but also on the remittance coming from out and this has some impact on the rural poverty alleviation. Prof. Silveira complimented on the same and emphasized that trickling down of economic growth is not so obvious unless there is a coordinated effort to make it sure it may not happened. As we have gradually increased the understanding about the complexity of development and also complexity within solutions with multiple dimensions, we have understood that coordination among different stakeholders is important to address these questions. This remains a major challenge when it comes to the implementation. When it comes to the poverty alleviation, this is an important aspect to be dealt with.

Mr. MA Gofran, biogas consultant from Grameen Shakti raised an important question about the types of digester proposed for the poly-generation system. As dome type of the digester is widely used in Bangladesh, he was more concerned on the proposal of Plug flow digester under this poly-generation. He also suggested having a demonstration unit with at least one dome type digester during further testing or demonstration of this technology. Dr. Mainali clarified the reasoning behind the proposal of the Plug flow digester as (i) its simplicity in construction, (ii) ability to handle larger volume and different types of feedstock efficiently and, (iii) does not required any internal mixing. Prof. Silveira further complimented this issue and clarified that the technological part of this project has been more focused on the performance of membrane distillation unit and not so much specific on biogas part as various proven alternatives already exist in the biogas technology. However, the possibility to combine different feedstock and other multiple advances as mentioned earlier we have concentrated on plug flow digester; we can always keep the option of checking the other alternatives open. At the same time, the sector should also be ready to accept new technological options if the new technology serves the purpose in much more efficient way.

Mr. Rajeev Munakami, Senior Advisor of SNV Bangladesh shared his experience with access to portable water in three different coastal areas by the private sector where the cost of portable water has

really gone high in the name of full cost recovery and has become out of reach to the poor. He suggested to take into account of affordability of rural people while designing such schemes.

Dr. Islam brought into attention that there is a standard for the requirement of minerals in the portable drinking water; he further requested to keep this issue into consideration.

Mr. Shahid Khan, Joint Secretary of Bangladesh Biogas Development Foundation opined that there can be several socio-economic barriers while launching new projects. Technology needs to be tested in real ground and only proven technology then after has to go for dissemination. He also stressed on the need of close monitoring of the demonstration schemes for the appropriate feedback in the technology development. Prof. Silveira acknowledged the comments made by Mr. Khan and also clarified that the various component within the poly-generation systems are already proven technology and only the concept of integration is new and needs demonstration. Prof. Silveira further added that we have realized that the solutions need to be looked going beyond technology and therefore, we have added the socio-economic and institutional component in this project. There can be different results and reasoning behind success or failure of the implemented technology. We fully agree that there is a need of very close monitoring system while the technology is tested in the field, she added.



*Workshop participants representing various organizations*

## **Second Session**

The second session was chaired by Prof Dr. Semida Silveira. As mentioned earlier, the second session was more focused on stakeholder discussion on making some strategies if this technology is worth for further development and go for demonstration and implementation. How to capitalize on the opportunities at hand to explore this type of technology? What are the issues to be considered when it comes to testing the technology on the ground? How to monitor benefits? What types of schemes

would be appropriate for devising projects applying such technology in rural areas? Prof. Silveira started with above provoking questions. Dr. Mainali made a presentation about some preliminary thoughts on some strategies to implement biogas based poly-generation in Bangladesh. Dr. Mainali discussed four key phases for a new technological system from development to dissemination viz. (i) feasibility phase (ii) Pilot or demonstration phase (iii) market development phase and (iv) deployment phase.

The participants were asked to make pair among themselves and discuss about the key steps (at least one) in each phase that they think important for taking rural technology from development to deployment. The following section is prepared on the basis of the inputs that have been received from the workshop.

## **Strategy formulation for Technology Development to Deployment**

### **Feasibility Phase**

The need assessment of such technological system in terms of the services that it provides is crucial. The technological system need to be developed meeting the local needs. Testing and evaluating the performance of system in the local context is important. The technology should be cost competitive and the services it provides should be affordable. Therefore, economic analysis of such technological system is important. Exploration of possible business model that is appropriate for the sustainable operation of such technological system is also a crucial step. It has also been suggested to have proof of concept in terms of integration of various sub components with the dynamic performance onsite test. The analysis made in the feasibility stage is theoretical and static in nature. Dynamic performance test on site is the next step for taking this technology development ahead.

### **Pilot/Demonstration Phase**

The pilot demonstration is must to proof /validate the concept not only from technological aspect but also from the socio-economic aspect. Testing and evaluating of such pilot project is required in terms its technical performance and overall business model. Since the poly generation is a multi-disciplinary scheme producing clean cooking gas, electricity and safe drinking water, multi-sectoral collaboration is deemed necessary to have synergy effect.

It has been suggested to have multiple sites with new biogas plants for such demonstration. Most of the participants suggested having a close monitoring with proper documentation and with the trial period of at least a year.

Some of the participants also suggested selecting at least one strategic location with easy accessibility so that various high officials from government, donors, researchers and others stakeholders could be taken there for the demonstration of the technology.

The participant also suggested for co-creation of the technological system involving the local private sector (manufacturing companies and or local NGOs) is important. This will help to reduce the cost of the technology and also help to develop local ownership in the development of the technology at local level. This is also needed for creating a sustainable local technological base.

Creating institutional support for sustainable operation and management of such technological systems are necessary. Building the local capacity for the operation and maintenance (O&M) of the technology is important for the same. O&M training, plant managers trainings are some of the identified activities under local capacity building. Besides, developing O&M manual capturing the whole technological system (translated in local language) is must to assure reliable operation.

### **Market Development Phase**

Identifying the customer segments to approach for marketing such technology is an important step within market development phase. Mobilizing micro finance institution, Banks and other local NGOs, and local private resources is a challenging task in developing the market. Such technological system might need the provision of subsidy or grant at the initial stage of the market development. However, the effort should be focused on identifying early adopters rather than focusing on subsidy based mechanism from day one.

For a sustainable market, focus should also be given to local capacity building (i.e. training the local manufacturer/installer about the technology. Priority should be given to use locally available technologies and resources without compromising in the quality where so ever possible. So as mentioned previously, co-creation of the product taking local partners on board could help in developing the sustainable market. Standardization and certification of such poly-generation system could help to create market reliability.

### **Technology Deployment**

Defining the Institutional framework taking all key stakeholders on board is the basic step to go for the technology deployment. Deployments of such clean technologies are often scale up with specific government or non-government led dissemination programmes.

Quality assurance system with regular monitoring and feedback system is very important for maintaining the standardization of the technological system. Non-quality product can ruin the market and may have very negative impact in the technology deployment. Quality should be assured both at the product level and at the service level. Establishment of poly-generation equipment test station (PETS) collaborating with local university or research institute at national level can help in maintaining the quality of the equipment. Selection of pre-qualified suppliers/installers, skill testing of local technicians for installation, operation and maintenance will help to maintain the service quality.

Exploring the public-private partnership and industry academia synergies can help to scale up the dissemination. Designing appropriate national policies and regulations may help to scale-up the commercialization of such technological system and create domestic markets, and drive down the costs. For example, relaxation on import tax and VAT exemption on the equipment that need to be imported could help to create a favorable market for such technology to go for mass dissemination.

### **Workshop Findings**

This workshop was organized with an objective to share the preliminary results of the project and to discuss with the stakeholder about the strategy that needs to be adopted if such technological system is

to be implemented. The active participation of 36 out of invited 40 participants in this workshop from different sector covering governmental, non-government organizations, from Swedish Embassy, other donor organizations, private sectors have made our mission successful. . At the end of the workshop, Prof Silveira summarized the findings of the workshop and wrap up the workshop.

Taking the biogas digester design that are in practice in Bangladesh into consideration for poly-generation, adding up minerals in distilled water from the membrane distillation are some of the important suggestion that were received positively in the workshop. Various approach and ideas were evolved during the discussion session to take this project in the implementation phase. The discussion has really helped us in completing our one of the task of formulating the strategies for moving such technological system from design to deployment. In overall the workshop has been successful in terms of achieving its objective.

# Annex I

(Programme Itinerary of the workshop)

**Workshop on Solutions to provide clean energy and safe drinking water in rural areas**  
**– Opportunities based on biogas and poly-generation**

20<sup>th</sup> Oct 2014,

Dhaka

Venue: Grameen Bank Auditorium; Grameen Bank Bhaban, Mirpur-2, Dhaka-1216  
 Bangladesh

Morning		
9.15-9:30	Introduction and Welcome words by the host	Mr. Abser Kamal, Grameen Shakti
09:30-9.50	Challenges to address poverty and infrastructure needs in the rural areas of Bangladesh	Prof Dr. M Alamgir (Vice-Chancellor of KUET)
9:50-10:15	Addressing rural needs and promoting sustainable development	Prof. Semida Silveira-KTH
10.15-10:35	Providing clean energy and water using locally available agricultural waste and cattle dung	Dr. Brijesh Mainali-KTH
10.35-11.00	Discussion	Participants are invited to share their ideas and experience about rural challenges and solution
11:00-11.30	Tea/Coffee and cakes	
11.30-11.45	Climate change and environment portfolio in Swedish Embassy: Brief Introduction	Mr. Magnus André, Swedish Embassy/SIDA
11:45-12.00	Climate Change mitigation potential of biogas-based poly-generation: examples from dairy and poultry farms in Bangladesh	Mr. Saad Been Emran-KTH
12.00-12.20	The role of the Grameen Shakti in promoting new technologies: from pilot to market dissemination	Dr. M S Islam, Grameen Shakti
12.20-12.45	Discussion	Participants are invited to give their views on climate change.
12.45-13.45	Lunch and mingling	
Afternoon		
13:45-14.00	Strategies to implement biogas-based poly generation in Bangladesh	Dr. Brijesh Mainali
14.00-14.15	From research to implementation – walking the talk	Prof. Semida Silveira
14:15-14:45	Discussion	Participants are invited to contribute with ideas for dissemination of biogas poly-generation technologies
14:45-15:00	How can the provision of energy services promote sustainable development – closing remarks	Prof. Semida Silveira- KTH
15.00-15:30	Tea/coffee and cookies	

Organized by the Energy and Climate Studies group at KTH Royal Institute of Technology, Sweden in cooperation with Grameen Shakti, Bangladesh

ANNEX II  
(Participant Lists)

**Participant from Different Organization Date: 20 October, 2014**

SN	Person name	Position	Institute	Contact details
1	<b>Prof. Semida Silveira</b>	Head of Energy and Climate Studies (ECS) Director of international affairs with Brazil at KTH	Royal Institute of Technology KTH, Sweden	Phone: +46 8 790 7469 E-mail: semida.silveira@energy.kth.se
2	<b>Dr. Brijesh Mainali</b>	Postdoc Researcher & Coordinator Biogas based poly-generation in Bangladesh		Mobile: +46 73 654 81 14 Email: brijesh.mainali@energy.kth.se
3	<b>Mr. Saad Been Emran</b>	Masters Student		-
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9	<b>Mr. Shadukul Islam</b>	Program Manager Rural Development Program,	Bangladesh Rural Advancement Committee (BRAC)	Mobile : +880 1712479952 Email: shadukul@brac.net
10	<b>Mr. Magnus Andre</b>		SIDA/Embassy	Email: magnus.andre@gov.se
11	<b>Dr. Muhammed Alamgir</b>	Professor	Department of Civil Engineering, KUET Vice Chancellor, KUET	Cell: +01711-884044, +01714-087277, Tel:+880-41-744584 (Off.)

12	<b>Mr. Rajeev Munakami</b>	Senior Advisor	FSM Programme Leader SNV	<a href="mailto:rmunankami@snnworld.org">Mobile: +880 1729094702</a> <a href="mailto:rmunankami@snnworld.org">rmunankami@snnworld.org</a>
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16	<b>Mr. Mahbubul Alam</b>	Researcher		
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20	<b>Mr. Syed Morshed Ali</b>		HVR Water Purification AB	-
21	<b>Mr. Shamsuddoha</b>		WAO Group	-
22	<b>Mr. Md. Mujibul Haque</b>	Chairman	BRS Engineering Works Ltd	Mobile: +880 1817507604 Email: mujibul12@yahoo.com
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24	<b>Mr. Jahangir</b>	Biogas plant Owner (3 Biogas plants each of 4.8 m3)	Elenga, Tangail	Mobile: +8801198383528
25	<b>Mr. Abser Kamal</b>	Managing Director	Grameen Shakti	Grameen Bank Bhaban (19th Floor), Mirpur 2, Dhaka 1216; PABX: +880-2-9004314 Fax: +880-2-8035345 Email: g_shakti@grameen.com, g_shakti@grameen.net
26	<b>Mr. Abdur Sattar</b>	General Manager		
27	<b>Dr. M. S. Islam</b>	Senior Consultant		
28	<b>Mr. M. A Gofran</b>	Biogas Consultant		
29	<b>Mr. Fazlul Haq</b>	Deputy General Manager		
30	<b>Mr. Md. Ahsan Ullah Bhuiyan</b>	Assistant General manager		
31	<b>Mr. Md. Sirajul Islam</b>	Senior Manager		
32	<b>Mr. Abdul Matin</b>	Senior Manager		
33	<b>Mr. Shamsul Arefin</b>	Senior Manager		
34	<b>Mr. Mahbubul Islam Patwary</b>	Manager		
35	<b>Mr. Md. Mahmudul Hasan</b>	Manager		
36	<b>Mr. bikash Das</b>	Manager		

## ANNEX III

(Glimpses of the Workshop)



