



DOMESTIC BIODIGESTER

Source : <http://www.bluenews-blueenergy.blogspot.com>

Product Catalogue - 2014

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EUROPEAN
MICROFINANCE
PLATFORM

NETWORKING WITH THE SOUTH

e-MFP ACTION GROUP
ON MICROFINANCE
AND ENVIRONMENT

Description and Working Principle

Domestic biogas digesters convert biomass from different sources (cattle or pig manure, agricultural residue) into combustible biogas and bio-slurry, which can be used as organic fertilizer. The biogas is a mixture of methane and carbon dioxide and can be effectively used in gas stoves for cooking and gas lamps for lighting. Recent developments also allow the application of productive use appliances such as milk chillers. The use of clean biogas not only reduces customer expenses on conventional energy, but also results in improved health conditions due to less harmful emissions from cooking and lighting appliances. As a by-product of fermentation, bio-slurry can be used as fertilizer, closing the nutrient cycle and reducing the user's expenses on conventional fertilizer. While there are different types of biogas digesters, all of them require a minimum of continuous, daily supply of biomass and water to keep the digestion process stable.

Technical Characteristics¹

Target group	Farmers, remote rural communities
Components	Inlet, biogas digester, gas holder, outlet, gas conveyance system, slurry compost pit (Fixed Dome Biogas Digester);
System size	Starting from approx. 4 m ³ biogas digester size; refer to table below
Time of construction	3 days (polyethylene biogas digester) and several days for fixed dome digester
Fuel type needed	Animal manure (cattle, pigs, etc.) and animal droppings (chicken), agricultural residues, depends on type
Fuel replaced	Firewood, natural gas, diesel
Other resources replaced	Chemical fertilizer (at least partly)
Minimum feed	20 kg of manure per day

Table 1: Scale of Fixed Dome biogas digesters and respective estimated output.^{2,3}

Biogas digester size [m ³]	Total cost [USD \$]	Daily dung feeding [kg]	Water to mix with dung [litre]	Use of biogas stove [hours]	Use of biogas lamp [hours]
4	USD \$ 550	20-40	20-40	2-4	8-16
6	USD \$ 620	40-60	40-60	4-6	16-24
8	USD \$ 720	60-80	60-80	6-8	24-32
10	USD \$ 800	80-100	80-100	8-10	32-40
15	USD \$ 1100	100-150	100-150	10 to 15	40-60

Ease of Distribution, Installation, and Maintenance

There are different types of small scale biogas digesters, such as fixed dome, floating drum and polyethylene tube digesters. Distribution, installation and maintenance measures depend on the type of biogas digester employed, the different space requirements, materials used and labour input for each type.

In the case of the low-cost polyethylene tube digester, construction and installation only needs half a day, assuming that the trench is already excavated and materials are available. The setup of the biogas supply line to the kitchen needs some more hours, depending on distance and specific requirements.

The installation and bricklaying of a fixed dome biogas digester is more labour-intensive, creating local employment whilst using only local materials. The different steps consist of surface preparation, excavation of holes, supply of building materials (brick, sand, cement, and stone), the actual mason works, installation of pipeline, fittings and appliances, and testing for leakages.

Technology Options

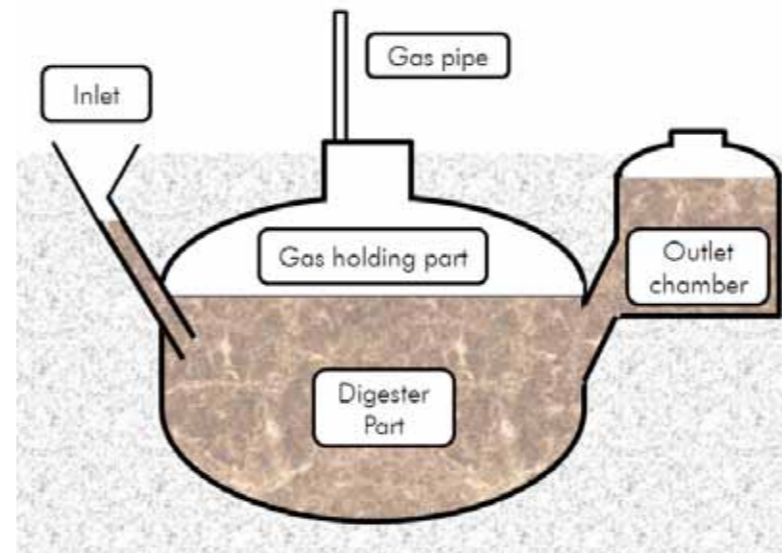
There are a variety of different types of small-scale biogas digesters using different materials and various dimensions, two of which have been proven in the field in several countries: the low-cost polyethylene tube digester and the fixed dome biogas digester. The first is an easy-to-implement and low-cost type of biogas digester, the main fermentation chamber consisting of a tubular polyethylene film at each end banded and fixed around a 6 inch PVC drainpipe, one pipe of which serves as inlet, the other one as outlet of the slurry. A more robust but at the same time more elaborate type of small-scale biogas digester, is the fixed dome biogas digester, mostly consisting of underground masonry structures with inlet, main digester, gas chamber and slurry outlet.^{4,5}

Price Range

System price depends on the type of digester as well as the size of the system, i.e. the volume of digester, location of construction, model and country. While the low-cost polyethylene tube digester is cheaper and available in a price range from USD \$120 – \$500,^{6,7} the price for a fixed dome biogas digester is higher, ranging from approximately USD \$500 to over \$1000 (see above).⁸

Type of Financing

Low-cost polyethylene tube digesters and fixed dome biogas digesters are suitable for microfinancing as well as for financial microleasing. Financial microleasing offered by microfinance institutions (MFIs) for fixed dome biogas digesters may imply longer payment periods due to stronger legal position of MFIs in this financial instrument. Both financing types are suitable for households as well as for SMEs.



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Economic and Social Impacts for End-Users

Biogas digesters produce valuable biogas that can be used as fuel for lighting and cooking, reducing costs on conventional energy or time needed to collect firewood. In particular, health standards in lighting and cooking devices are improved due to avoided indoor pollution, such as emissions of smoke, soot and other harmful substances. With the use of biogas digesters, value can be generated from animal manure, human excrements and agricultural residues, increasing income and providing incentives to improved hygiene. As a by-product of the fermentative process, odourless bio-slurry can be used as fertilizer, closing the nutrient cycle and reducing the need for conventional fertilizer. For larger scale applications, the biogas can be used to run a power unit, generating carbon-neutral electricity.

With at least two cattle or six pigs, an average household can meet their daily lighting and cooking needs. Associated investment costs of a good quality biogas digester vary between USD \$260 - \$1100, depending on digester size, location of construction, model and country.⁹

Benefits for the MFI

Savings on fuel expenses as well as conventional fertilizers will enable customers to pay back their loan, with an estimated amortization time of approximately 2.5 - 3 years only.¹⁰ Additionally, the organic fertilizer produced will provide further savings and/or increase household income. As a result, microfinance institutions will get a high repayment rate of both loan principal and interest. Since the technology brings not only economical, but also social benefits, an increase in demand for microfinancing instruments is expected.

Environmental Benefits

Environment: it reduces the pressure on natural resources: deforestation and use of chemical fertilizers. It promotes the use of organic fertilizers that can restore poor infertile soils and improve yields. It reduces the emission of particulates. It reduces the use of kerosene and dry batteries, and it reduces fire hazards and their impact on forests.

Climate change mitigation: reduction in greenhouse gas emission from firewood and dung.

Climate change adaptation: it reduces vulnerability due to environmental degradation and energy and fuel price volatility.

Potential positive synergies with: livestock and gardening financing, technical assistance (TA) and certifications for organic production or agro forestry, solar water pump.¹¹

¹ SNV, Dutch NPO: <http://www.snvworld.org/en/sectors/renewable-energy/about-us/potential-of-domestic-biogas>

² http://www.nbp.org.kh/index.php?page=biogas&lang=en&c=biogas_detail

³ Brown, Michael et al. (2010): Sanitation in Floating Communities in Cambodia, Ministry of Rural Development

⁴ Lürer, M. (2010): Installation manual for Low-Cost Polyethylene Tube Digesters; GTZ/EnDev

⁵ NBP (2005): Farmer's Friend Biogas Digester Model Construction Manual – National Biogas Digester Programme, Cambodia

⁶ Lürer, M. (2010): Installation manual for Low-Cost Polyethylene Tube Digesters; GTZ/EnDev

⁷ [https://energypedia.info/wiki/Experience_with_Polyethylene_Biogas_Digester_\(PBD\)](https://energypedia.info/wiki/Experience_with_Polyethylene_Biogas_Digester_(PBD))

⁸ http://www.nbp.org.kh/index.php?page=biogas&lang=en&c=biogas_detail

⁹ SNV, prices given in €: <http://www.snvworld.org/en/sectors/renewable-energy/about-us/potential-of-domestic-biogas>

¹⁰ SNV: <http://www.snvworld.org/en/node/1489/>, Ashden Awards – Sustainable solutions, better lives: <http://www.ashden.org/biogas>

¹¹ For further information on potential synergies check the other product catalogues for EE and RE technologies.

European Microfinance Platform

The European Microfinance Platform [e-MFP] was founded formally in 2006. e-MFP is a growing network of over 120 organisations and individuals active in the area of microfinance. Its principal objective is to promote co-operation amongst European microfinance bodies working in developing countries, by facilitating communication and the exchange of information. It is a multi-stakeholder organisation representative of the European microfinance community. e-MFP members include banks, financial institutions, government agencies, NGOs, consultancy firms, researchers and universities.

e-MFP's vision is to become the microfinance focal point in Europe linking with the South through its members.

e-MFP Microfinance and Environment Action Group

e-MFP Action Groups facilitate synergies among e-MFP members and encourage them to implement activities together, thus contributing to the advancement of the microfinance sector.

The aim of the e-MFP Microfinance and Environment Action Group is to bring together microfinance practitioners to discuss and exchange experiences in dealing with environmental issues and to create new practical tools to advance environmental microfinance. The Action Group is also intended to act as a think tank that disseminates its results among e-MFP members and the microfinance sector at large with a view to increasing the awareness of and commitment to act on these issues. It is meant both as an internal knowledge-sharing and external awareness-raising platform that serves as a reference in the microfinance sector.

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