Policy Brief: Biogas – Meeting Energy Needs in Rural Nepal

Meeting the energy needs for domestic and productive use has been a major problem in Nepal. More than 76 percent of the population depend on biomass (Ministry of Finance, 2015) for domestic as well as productive uses (home based enterprises) in the rural areas. In case of fossil fuels, the country is totally dependent on India. The country is faced with a double-edged sword when dealing with the issue of energy. This is true for biomass as well as fossil fuel: on the one hand, fuel wood availability is diminishing, and at the same time, this is accompanied with a higher demand for energy. This necessitates the promotion of alternative energy sources urgently, biogas being one of these.

Biogas Plants – Technology Promoted In Nepal
Biogas plants capture gas (methane and carbon dioxide) released from animal manure for use as a household fuel for both cooking and lighting. Inthe biogas, dung is inserted through an inlet into a sealed mixing pit, where biogas is generated through anaerobic digestion. The gas is collectedin an outlet pipe and piped to the household where it is burned in a gas-burning stove (biogas stove), identical to an LPG stove.
Source: BSPN various reports



Since 1992, bio-gas systems have been contributing to the renewable energy sector in Nepal in a large way. The Biogas Support Program (BSP) initiated the program including subsidy and loan provisions to farmers for installing these systems. The program is implemented underan effective public-private partnership and built a cadre of well trained and well managed biogas construction companies.So far, 346,439 systems have been installed(BSP Nepal, 2016). This has been possible under.

Benefits of using biogas plants
Biogas use offers a cascade of benefits for families and communities.

- Time saved on collecting fuel wood, cooking and washing dishes - a female adult saves up to 123 minutes a day while a male adult saves up to 85 minutes a day.
- Improved through reduced indoor air pollution, caused by use of biomass fuels before. Biogas users breathe better, thanks to the smoke-free kitchen.
- Engagement of women in various income-generating activities in the time saved by use of biogas.
- Self-improvement and empowerment, through use of saved time to attend literacy classes, listen to radio or watch television, read newspapers, do social work, play or study. Women take part in village meetings and participate in informal women's savings groups that also provide loans for income generating activities.
- Use of biogas slurry as organic fertiliser, which cut 25 per cent of the costs for chemical fertilisers. This also contributes to diversified crops, sustainable income from agriculture and consumption of safe and nutritious foods has improved the food security of farm families in the biogas programme.
- Construction of toilets linked to each household biogas unit has given villagers better sanitation facilities, which mean fewer chances of illness. Open defecation was a key health issue in several villages.
- Employment generation to more than 80 biogas companies engaging 12, 000 persons in different capacities: masons, supervisors, technicians.

Source: BSPN Various Studies

Biogas in Nepal is an old, tested solution, and was initiated by the Agricultural Development Bank, Nepal (ADB/N) in the 70s and Biogas Support Promotion Project implemented by SNV, supported by the Government of Netherlands in the early 90s. In all these years the country has been promoting only one technology, fixed dome, GGC2047, though the use of different wastes (animal dung, human faeces and organic waste from the kitchen and dumping sites) has been encouraged.

Compared to other renewable energy technologies (RETs), biogas promotion has achieved a great momentum under BSPand reached all 75 districts of the country, delivering benefits to approximately 6 percent of total households. This is nearly 23 percent out of potential number.

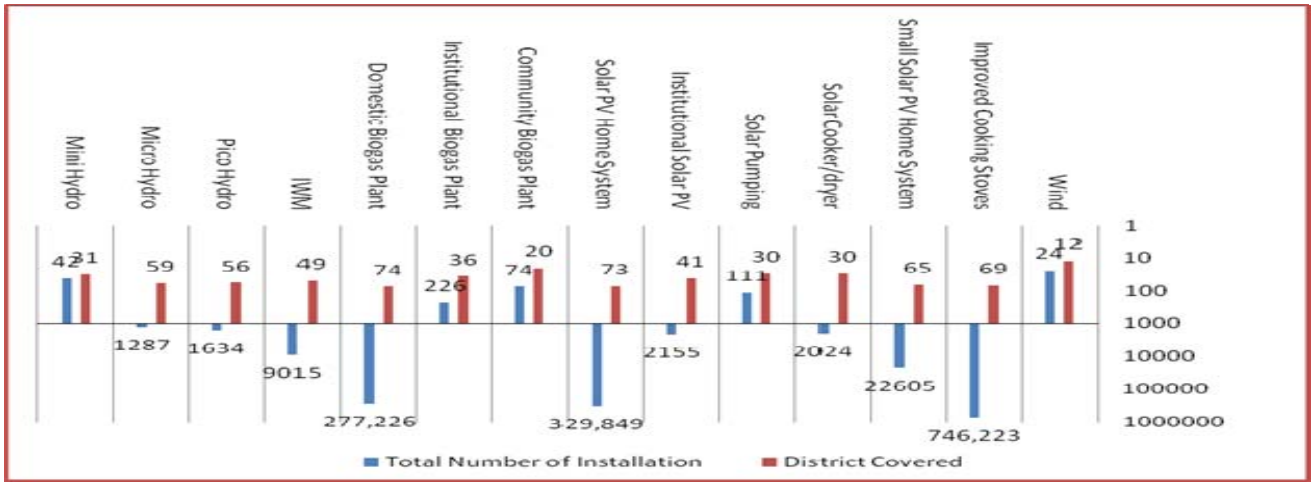

Figure 1: Summary of installed RETs in Nepal till mid July 2012

Source: Baseline for Rural and Renewable Energy Technologies 2012, AEPC

The primary factor favouring biogas was initially thought to be the presence of a large livestockpopulation, which is an integralpart of Nepalese farming system. In the year 2013, the total households with large cattle, in Nepal, were estimated to be 2.5 million. Based upon the same report from AEPC 2013 report, the geographically and technically feasible biogas potential of the country is estimated to be 1.3 million household level plants, of which705,815 are in the Tarai (plains), 576,557 in the hills and the rest 27,371 and 14,193 in remote hills/mountain region and urban areas respectively. Biogas technology is directly contributing to minimize the use of fuel wood, agriculture residues, animal dung, kerosene particularly source of energy using for cooking purpose.

- The biogas sector has been receiving government support since GoN's Sixth Five Year Plan (1980-1985)[1]. Over the years the objectives for promoting the biogas systems have been driven by reducing dependency on fuelwood thereby conserving forests; scaling up access to rural energy and poverty alleviation.

[1] National Planning Commission Reports (various)

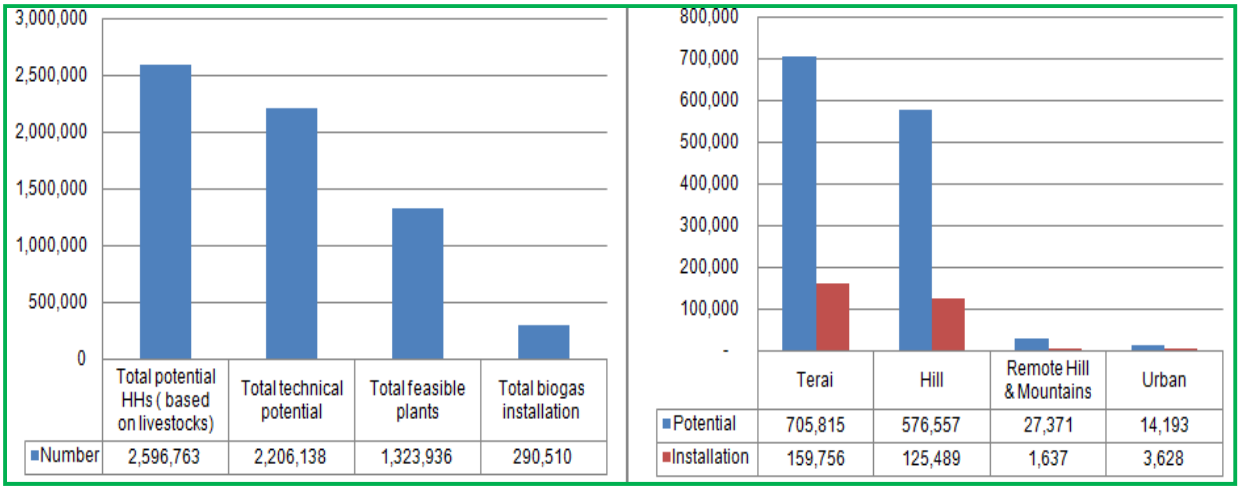

Figure 2: Total domestic biogas potential in Nepal

Source: AEPC, 2013

The policies also encourage the promotion of domesticas well asinstitutional and community systems.The program is implemented through an inclusive approach (integrating gender and marginalized groups) providing fiscal support and local capacity building for women and the marginalised groups.

The recent blockade of 2016[2] has encouraged both the politicians and the general public to search for alternative energy forms especially for cooking, and renewed an interest in promoting renewable energy use. In order to reach energy services to all the rural and remote areas of Nepal in a cost-effective manner and also on the experiences and in-country skillpromotion of biogas could be an option.

However, biogas systems in its present technical state doesnot serve as a primary household energy source for most households, which means that the dependency on energy mix practice, including fuelwood with all its attendant problems, still persists. Why so?

Direct Benefit of Biogas

- *Reduction of workload of women/children @ 3hours/plant/day*
- *Fuel wood @ 2 tonnes/plant/year*
- *Agriculture residue @0.35 tonnes/plant/year*
- *Dung cakes @ 0.60 tonnes/plant/year*
- *Kerosene @6.4 liters/plant/year*
- *Dry bio-slurry/bio compost@1.75 tonnes/plant/year*
- *Annual reduction of GHGs emission CO_2 equivalent @4.2 tonnes/plant/year*
- *Proper usages bio-slurry and bio-compost@80% HHs*

Source: Various Studies of BSPN

Key Issues

Technical

Improving biogas technology: The biogas plants promoted under BSP is the fixed dome type, GGC 2047 model. The capacities of the domestic biogas plants range from 2,4,6,8 m^3 where cow and buffalo dung and water are the main feeding materials. To date focus has been on promotion of systems for single households. This technology has been promoted since last 20 years with very little change. Nepal has made

Area Covered by Biogas Plants (including compost pit)

Size	Length	Width	Area
M3	M	M	M2
2	5.75	2.3	13.23
4	8	2.7	21.6
6	8.3	3.2	26.56
8	8.5	3.5	29.75

Source: Interaction with BSPN, 2016

[2]Oct 5, 2015-The fuel crisis was created by the blockade in Nepal by India affecting the country's energy security. As Nepal is completely dependent on India for petroleum products, a halt in fuel shipments led to an acute shortage including cooking gas. http://bit.ly/1KVhwwp

some headway in the promotion of larger size systems however, the current technology needs to be upgraded for better efficiency and multiple uses. According to BSPN, large systems are only 40 percent efficient. The large biogas plants occupy valuable land area, which is a problem since it infringes in precious cultivation area in rural areas and is expensive in urban areas. Systems with higher efficiency will also enable the use of systemsshared by a number of households.

Need for multiple use of biogas energy

A problem of the current technology is the low capacity of the system permitting only single use – only for cooking (though a very small percent of the systems have been used for lighting as well). Biogas applications must go beyond thermal use alone, such as for small scale power generation. Compact, cost efficientbiogas systems that are easy to implementand are able to meet multiple uses needs to be developed.

Economic

Given the high cost of biogas systems, despite the subsidy provision, it is only the well-off households and the astute ones who have adopted it. Of the remaining potential areas, these are either in remote areas where households belong to the lower economic quintile and the service providers (biogas companies) are absent or reluctant to go. Besides, several of these areas are challenged by absence of transport services and market for construction materials which increases the cost of materials required for installing the systems. Promoting biogas in these areas call for special considerations to deliver the necessary services including post installation and the initial investment costs.

Social

There is a need to understand the role of energy in the livelihoods of men and women. There is a distinction to be made between women's demand for energy at the local level to meet household needs, and that of the menwhich is predominantly for income activities. Meeting these different energy demands for women and men requires different solutions that addressissues of land ownership, land use and management, access to resources, development of woodlots, and provision for sustainable fuel. In case of biogas, women still spend time in the collection of dung, extra water and mixing the feed (dung and water), with dwindling livestock holding the ability to operate the system becomes a challenge. Though human and kitchen waste based systems are being promoted the performance of these systems are not as efficient which pushes the users to depend on multiple fuel thereby increasing energy expenses. Space required for installation of biogas too remains prohibitive for the landless in the rural areas as well and in urban areas. Thus even if use of biogas is to be promoted it must be taken up with judicious actions in place. The way forward calls for the following actions:

Key Messages

Energy is not a stand-alone issue: Energy provision should be integral to social and economic benefits such as health, education, nutrition outcomes and income generation and built into the overall design of development plans. Hence, it must be integrated into policies, strategies and interventions related to food security, literacy, livelihoods programmes, income generation and forestry programmes. This calls for co-ordination with other development sectors and not dealt with in isolation.

Need for integrated policythat creates an enabling environment for improving the technology. This requires the following:

A. Recognise the potential, multiple roles of biogas technology and create an environment for improving biogas systems for wider use such as lighting, cooking and generating electricity for operating appliances

B. Improve the efficiency and convenience aspects of the technology and, most of all, increase the scale of operation from household to group or community / village level through concerted research and pilot programs
C. Develop measures for promotion of community based systems that help rural households with incentives such as waiving license fees and importation tax on biogas accessories and financial support to the users (subsidy, including loan).
D. Ensure coherence and coordination between public and private sector for technology improvement and effective service delivery. For example, coordination between Forestry Departments (with an interest in forest management and conservation) and Energy Departments (with an interest in wider promotion of biogas technology).
E. Multi-stakeholder consultation including local government at provincial and grass-roots organisations so that policy making is informed by inputs from all levels.
F. Capacity development of users, service providers and the planners is of utmost importance
G. Effective monitoring at different levels through third party with necessary award and penalty mechanisms must be mandatory

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Interaction with

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